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# ELECTRICAL INSTRUMENTS UNCOVER HIDDEN SHOP LOSSES

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"REDUCE costs, and then reduce them some more." That is the order of the day. Of the means of cutting costs available to users and producers of metal-working equipment the electrical instrument has not received the attention it deserves. How various electrical devices can be used to ferret out losses that have crept into the application or design of equipment is outlined by an authority in this article.

INDUSTRY has come to depend almost entirely on electric power. This form of energy lends itself most conveniently to measurement. Detailed analyses of power-driven equipment are very simply performed with the aid of electrical instruments. Although there are notable exceptions, the machine tool field in general is yet unaware of the potentialities of these instruments. The purpose of this article is to give the builder and user of machine tools a detailed picture of the applications of these devices to the machines themselves, as well as a very general picture of their other uses in the plant.

A simple means of determining the torque or power requirements of a machine is provided by the dynamometer. Instruments of this type may be divided into the two very general classes: absorption dynamometers and transmission dynamometers.

### Dynamometers and Their Uses

The absorption dynamometer, as its name implies, is a device in which the power is absorbed or degenerated into useless form, generally by converting it into heat. This type of dynamometer functions not only in the capacity of supplying loads for the particular machine but also provides a means of measuring the load. It is readily apparent where large amounts of power are to be measured that this method is not only wasteful, but the practical application of this method immediately presents embarrassing difficulties. In this group are placed such devices as the Prony brake, hydraulic and fluid friction brakes, fan brakes, electromagnetic and electric brakes.

The transmission type of dynamometer in general can be considered as a device which is interposed between the power source and the driven apparatus, means being provided by which an indication of either the driving torque or the total power transmitted to the device is made. The transmission dynamometer absorbs only that part of the power transmitted to it which is represented by the friction in the dynamometer itself. The remainder is delivered to the driven mechanism.

The principal forms of transmission dynamometers are the lever, torsion and cradle types. One application of lever type is in the device using a beam with an adjustable weight to balance the reaction of an idler gear. The torsion type may be represented by the method in which the angle of twist of a length of shaft due to torsional stress is measured either optically, electrically or by mechan-

ical means. The cradle type usually employs an electric generator mechanically mounted so that the torque reaction between the field and armature can be measured by weight.

All of these methods require more or less elaborate equipment which usually is not warranted in the everyday practical testing of machine tools.

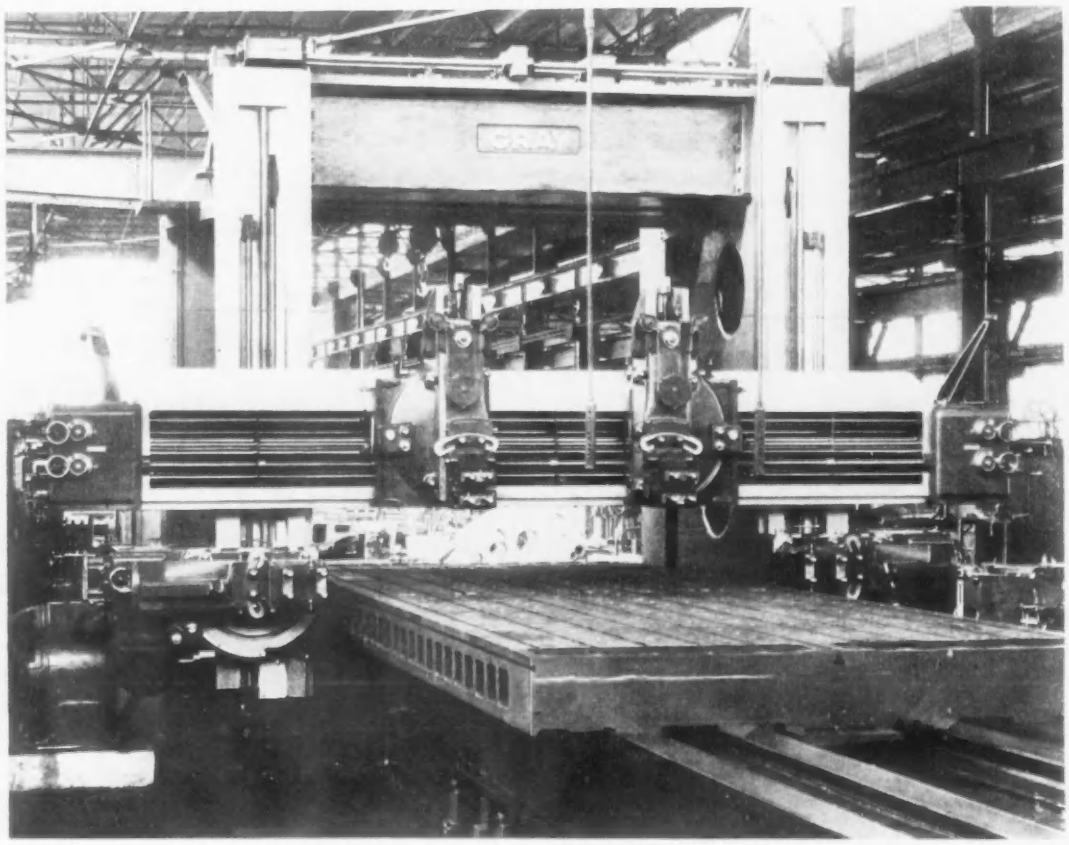
### Indicating Instruments Used for Steady Loads

Individual drive is to be found in the great majority of machine tools in use today. If we apply instruments to the motor of a machine tool, we can determine the amount of power entering the motor. By a simple correction of this value for the small percentage of power losses, we have the power delivered to the machine tool. In other words, by applying electrical instruments to the motor of an individually driven machine tool, we have for most practical purposes, a very satisfactory method of measuring the power used. That such a tool is at the disposal of the plant engineer by the temporary addition of electrical instruments is a fact which is insufficiently realized. Once the possibilities of such a combination are appreciated, it will be readily apparent that its advantages are valuable.

Indicating instruments, as the name implies, give the momentary value of the quantity which they are measuring. A typical example of an indicating instrument is the ammeter on the dash of an automobile for indicating the flow of electrical energy to and from the battery.

The direct-current indicating instrument may be constructed on the D'Arsonval principle in which a coil of wire carrying an unknown current, or a shunted portion thereof, is wound on a rectangular frame which is so mounted in jeweled bearings that it is free to move in the annular space between the pole pieces of a powerful permanent magnet and a soft-iron core. Alternating current instruments are usually constructed on the direct-reading dynamometer principle or the Thomson inclined coil principle. The pointer fluctuations are damped by means of Foucault currents set up in a thin aluminum segment attached to the shaft which oscillates in a magnetic field with each movement of the pointer.

Indicating instruments in general are applied to loads which are relatively constant for appreciable intervals. In some instances they can be used on loads in which the fluctuations are not too rapid for reading. On rapidly fluctuating loads, the damping of the instrument and inability to read the instrument, preclude its use for definite readings. The single value of the instrument under such conditions lies merely in its ability to indicate the presence of fluctuations.



USE of the electric recording instrument has permitted a sound approach to improvement in planer design.

### Ascertaining Power Consumption of Cutting Tools

An actual and typically practical application of the indicating instrument was in the determination of the power consumed by cutting tools undergoing tests. These tests concerned the determination of the correct cutting angles and rakes on various types and kinds of tools. Extensive tests were conducted especially with cemented tungsten carbide tools.

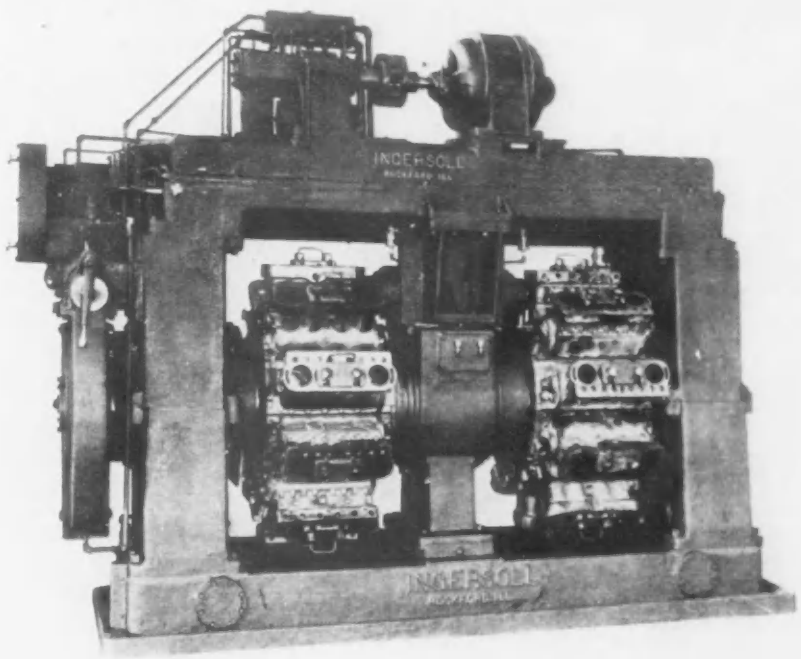
The power which is transmitted to a machine tool is partially consumed by the friction of the machine

tool itself, while the remainder is represented by the work performed in removing the metal and the conversion to frictional heat at the nose of the tool. For a small percentage change in the power consumption, the frictional load of the machine tool is substantially constant and any difference in power may be considered as being used in the removal of metal.

To illustrate this, let us assume we have two tools which we wish to test. The first tool starts cutting with a motor input of 10 hp. After 20 min. of cutting the motor input has increased to 11 hp. The second tool is substituted and also starts cutting with a motor input of approximately 10 hp. After 20 min. of cutting the motor input has increased to 12½ hp. With all other factors substantially constant, this immediately permits a direct comparison of tool angles and rakes, efficiency of tool edges, effects of various grinds and laps, and even frictional coefficients of the various grades of tool materials.

Since heat at the point of a cutting tool is highly undesirable, both from the standpoint of tool life and accurate work, a comparison of the power consumption of two tools tested under the same conditions is a direct indication not only of the probable tool life in pieces per grind but also accuracy of work and number of rejected parts.

Power readings of metal stocks made on the same machine with the same tools will give a direct indication of the machineability of one stock compared with another. Lubricating oils and cutting mediums, by effecting a reduction in the electrical power required, all other conditions remaining constant, immediately illustrate their effectiveness and suggest another use of indicating instruments.

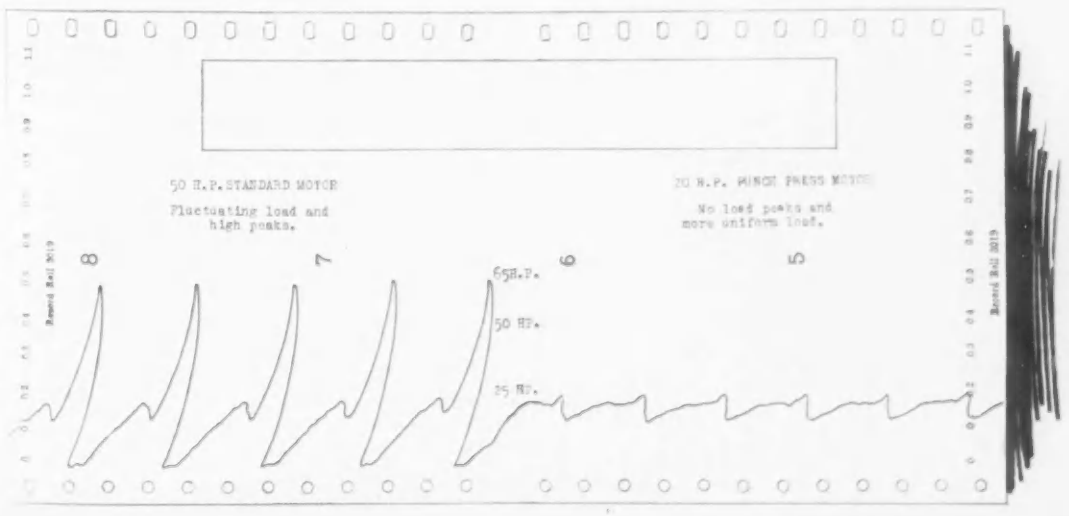



A SIX-SPINDLE, two-station, drum-type continuous milling machine, a high-production machine which must be timed to a nicety. The recording instrument is invaluable in the design of such equipment.

### Detecting Defects in Equipment

By the same token, if, while using substantially the same stock and tools in the machine, the power increases or fluctuates, an investigation will usually reveal deranged equipment, which may result in serious damage if permitted to remain. Sprung shafts, tight bearings, broken thrust collars, defective oil systems, dull drills, broken cutter teeth, and a host of other defects which may be reflected in the flow of electrical energy, are, of course, immediately reported by the electrical instrument. Once warned of an unusual condition, the machine can be made inoperative until the difficulty is located and before any further damage results.

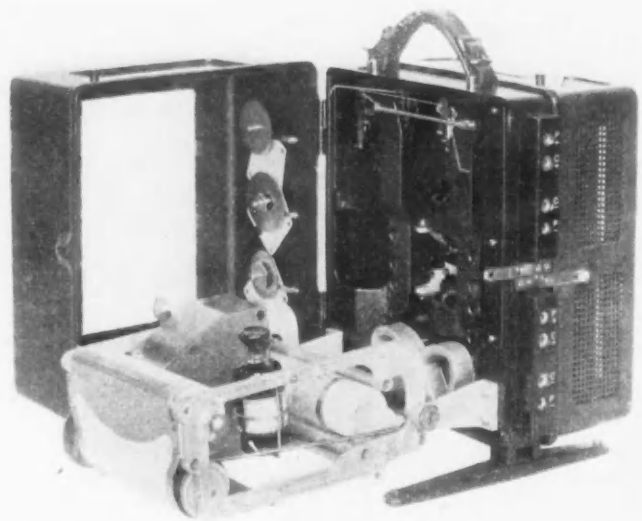
In addition to the direct application of indicating




RECORDING instruments make it possible to determine the proper size of motor for a given application. The graph shows typical recording instrument curves, illustrating correct and incorrect motors for a punch press.

instruments to machine tools, there is, of course, the well known use of these instruments in the substation of the plant of the machine tool manufacturers and machine tool users. Abnormal and fluctuating voltages, load conditions and similar factors of necessary consequence in the power supply are readily determined by means of indicating instruments.

Special applications such as the determination of temperatures using thermocouples, speed by means of magnetos, vibration as shown by detectors, and



PORTABLE recording wattmeter, showing it closed with roll showing and opened with chart carriage tilted for the insertion of the roll. The inking element of the instrument is shown separately.

minute measurements as indicated by the electric gage can only be mentioned at this time.

### The Recording Instrument for Varying Loads

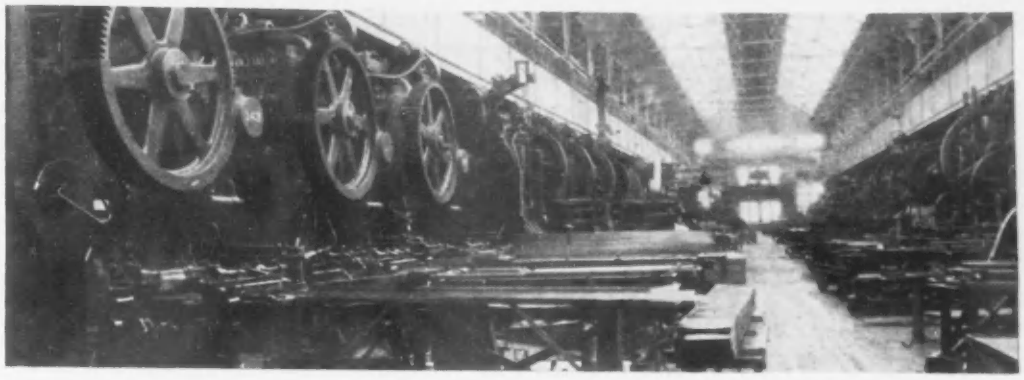
The recording instrument, in very general terms may be described as an indicating instrument so arranged that an accurate record of the needle fluctuation is readily obtained. The needle or pointer is usually constructed from a tube having a very small diameter. One end of this tube carries a platinum tip while the other end is submerged in an inkwell. The top of the pen rests upon a chart which is unwound from one roll, carried beneath the pen, and rewound on another roll much after the fashion in which the film in a camera is fed past the lens. This chart can be made to move at various constant rates, power being supplied either by a spring motor or by a small synchronous motor. The chart passes by the pen at a certain rate and the pen traces its movements on the chart. The record thus represents the variation of whatever is being measured with respect to time.

It is obvious that the recording feature just described has little purpose when applied to virtually constant loads except to record any unexpected fluctuations. However, virtually constant loads are a rare occurrence in the machine tool field. The automatic screw machine, the reciprocating planer, the punch press, drilling and tapping devices, and a large number of similar machines, have anything but a constant load. Every indexing operation, every traversing movement, every change in conditions immediately causes a change in the flow of electrical energy.

By virtue of this change, the recording meter lends itself remarkably well to the analysis of machine tool problems. In properly counter-balancing equipment to conserve power and minimize strains and shocks, the recording instrument is of material help. In studying accelerations and decelerations, in obtaining greater production more economically, in analyzing the attendant forces, in determining correct design, the recording instrument is a worthy assistant. In substituting facts for guesswork, definite curves for estimates, dependable records for hearsay and measured performance for intuition, the recording instrument plays a rôle which can be fully appreciated only by those who have used it.

### Machine Tools "Overmotored"

Although cemented tungsten carbide is at the present forcibly calling attention to the general inadequacy of machine tools to meet its power requirements, it is a fact that machine tools have in the past been much overmotored. The practice was chiefly the result of overestimating the actual power requirements and the attitude that the cost of the motor represented a small part of the total invest-



BATTERIES of incorrectly motored punch presses present the opportunity to effect real savings in fixed charges and operating expenses.

ment and therefore did not warrant careful consideration.

Many plants using batteries of machine tools have, however, learned to their surprise that the fixed charge differential on the oversize motors and their effect on the monthly power bill might easily take care of the salary of a competent plant engineer. Correction of this condition depends upon the determination of the errors and their elimination. Some typical examples will be given to illustrate this more fully.

Machine tool operation may be classed in several general types, one of these being the reversing cycle. Typical applications of this cycle are to be found in burnishing machines, tapping and threading operations, the reciprocating planer, and others. Reversing cycles are a study in themselves. The dynamics of the problem, involving moments of inertia, acceleration and deceleration, transfers of energy, is capable of playing sly tricks on the harassed engineer who is attempting to keep each factor in its proper place.

### Analyzing Power Requirements in Reversing Cycle

The power involved in a reversing cycle can be readily divided into two general parts. The one part is absorbed in removing the metal or performing the operation, the other part is consumed in bringing about the acceleration and deceleration of the moving parts. As already intimated, prediction of the power required under any one combination of the numerous factors involved is attendant with real difficulties.

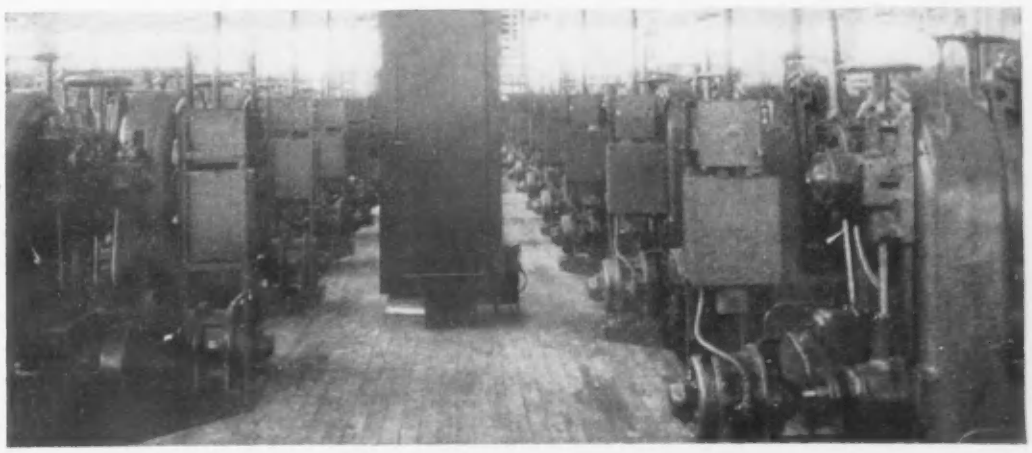
Unfortunately few realize or take advantage of the analytic ability of the recording instrument. Accelerations and decelerations are reflected in definite waves on the test chart. The timing of the cycle becomes known in all its details. The power requirements of the operation itself are clearly indicated and segregated from the power required to effect the reversals of the moving parts.

Planer equipment has been the subject of such analyses for quite a number of years. Such a record of a planer in operation will actually represent a performance curve of the planer itself. A study of the pictures drawn by the recording instrument will materially assist in selecting the proper electrical design for the particular planer. By effecting improvements in the electrical equipment, a corresponding increase in planer efficiency will immediately be apparent.

Space will not permit application details. However, the preceding should indicate the possibilities of employing recording instruments in the study of all automatic cycles. Timing can be readily checked by the regular recurrence of the various characteristic shapes in a curve. Strains and shocks can be eliminated by proper interpretation of the abrupt peaks of a record. Greater efficiency in general can be obtained in all automatic cycles by eliminating the losses detected with the aid of the graphic instrument.

### Analysis of Flywheel Applications

Another type of load which lends itself admirably well to analysis by means of recording instruments,



THE lower power factor of batteries of machine tools running under light loads has a bad effect on the monthly power bill. A formidable installation of automatic gear cutters is shown.

is the flywheel application. Usually such loads are characterized by abrupt and severe power peaks of relatively short duration. The load factor is extremely poor; that is, without a flywheel, the motor is overloaded for a brief period, but runs light the remainder of the cycle with accompanying low efficiency.

In order to mitigate these undesirable features, inertia is purposely introduced, usually in the form of a flywheel. With such an addition and with a properly designed motor, the severe electrical power peaks cannot occur since their occurrence is headed off by the sudden slowing down of the motor. There will be no change in the power required to do the work or in the energy peaks that occur in the machine tool itself. These peaks still exist as far as the operation is concerned.

However, a flywheel protects the motor from these sudden demands and this, of course, materially reduces the electrical power peaks. Before the motor can be affected, the flywheel must slow down. In meeting the demand by slowing down, the flywheel must give up energy which immediately decreases the electrical demand. The rate at which the load is applied to the motor is now gradual instead of abrupt and depends on the deceleration of the flywheel. By the time the flywheel has retarded to the point where about normal load has been imposed on the motor, the peak load is passed. After the peak has passed, the motor is no longer without a job but is kept busy restoring energy in the flywheel by bringing it back to speed again. Thus the effect of the flywheel is to chop off the peaks and fill the valleys, giving a more constant input curve to the motor.

One of the essentials to successful operation is, of course, the proper design of the elements. To estimate or calculate the proportion between the flywheel effects, timing of the cycle and motor characteristics is no simple matter. Yet the use of a graphic instrument will immediately show whether the motor is incorrectly designed, the effectiveness of the flywheel and the coordination of the factors involved.

Generalities lack the ability to give the impression that examples do and the following typical experiences were chosen somewhat at random to illustrate practical applications of indicating and recording instruments.

### Tests of Drills and Taps

A prominent manufacturer conducted extensive tests in order to determine which of the many brands of drills and taps on the market were the most economical brands for his purposes. The information was obtained by means of life tests. The experiments included the drilling and tapping of cast iron and steel test blocks. Power requirements were obtained by means of a recording instrument. Dulling of the drills and taps was determined by a definite increase in power requirements.

In applying cemented tungsten carbide, this same manufacturer found many of the machine tools inadequate in power equipment. That this condition exists generally is recognized only after a fashion. However, the same manufacturer employed instruments to determine the facts and two examples were little short of startling. A lathe normally employing a 20-hp. motor was equipped with a 35-hp. motor. Using cemented tungsten carbide tools and with no special effort on the part of the operator, inputs of 50 hp. were measured with the aid of an indicating instrument. A three-headed boring mill for which a 15-hp. motor was specified by the manufacturer was equipped with a 50-hp. motor. Electrical instruments indicated the motor could easily be loaded to its normal capacity with but a single tool cutting at one time.

### Graphic Meters for Punch Presses

Probably one of the outstanding examples of the uses of electrical instruments in the machine tool field is the application of the graphic meter in the correction of punch press motorization. The motor requirements for metal-forming presses have for years been overestimated from 25 to 200 per cent. Users of these tools were unwittingly paying large sums needlessly in fixed charges and power consumption bills.

The press manufacturer specified a motor which was inherently stiff; that is, when the load came on coincident with the engagement of the dies and work, the motor would not slow down but assumed the load and drew a large amount of power. In order to handle this power, the capacity of the motor had to be large. With a stiff motor, the flywheel had no opportunity to slow down and deliver some of its energy and thereby reduce the load peak on the motor. With the peak passed, the flywheel was little changed in speed and the motor, having little to do, was, of course, very inefficient.

### Soft Motor Substituted

By substituting a soft motor, that is, one that would slow down upon the application of load, the flywheel was made effective. Since no accurate and generally practicable method of determining power requirements for punch presses has been developed to date, these results were of necessity obtained by test. Graphic instruments made it possible to determine the proper motor for a particular application. Literally miles of curves were taken on this survey alone. Some of the results obtained were little short of phenomenal. Seventy-five-horsepower motors replaced by 25-hp. motors, and 30-hp. motors by 10-hp. motors, were by no means unusual substitutions. Such substitutions effected wonders in the reduction of power peaks and the substitution of a substantially constant load for a highly intermittent one.

### Plant Power Surveys

Although the preceding remarks have been chiefly limited to the use of instruments in connection with power requirements of the individual machine tools, the reader should not be led to believe that the application of instruments in the machine tool field is necessarily so limited. The full range of possibilities for these devices is too large to be treated in an article. However, two further important uses will be briefly mentioned as suggestions for further possibilities. The first of these is the power survey with

(*Concluded on page* 1584)

# Normalizing Automobile Sheet Steel

COLD-WORKED specimens of commercial automobile fender stock were normalized at temperatures ranging from 1400 to 1800 deg. F., as described in a paper by William F. McGarrity and H. V. Anderson before the American Society for Steel Treating, at Boston. X-ray diffraction patterns were obtained for each specimen; also, photomicrographs were taken at 100-deg. intervals. Erichsen values gave a measure of the workability of the metal at the various temperatures.

Increase in preheating time made no difference in the resulting structure, while increase in the soaking time gave slightly larger grain size and a more definite alinement of the crystals. A temperature of 1700 to 1750 deg. F. gave the best structure, checking Erichsen tests.

Formerly, box annealing was used to secure the deep-drawing results. With the innovation of continuous normalizing furnaces in 1926, however, extra-deep-drawing sheets and more complicated pieces could be made. The term "normalizing" is defined as "air cooling from a temperature exceeding the critical range." Its purpose is:

1. To eliminate the crystalline deformations due to the rolling.
2. To relieve internal strains.
3. To obtain equiaxed grains.
4. To obtain sorbite from the new fine-grained structure by the cooling, and thereby regulate the hardness and ductility of the material.

The obvious advantages of continuous normalizing over box-annealing are:

1. Much shorter time required for the operation.
2. More uniform heat treatment.
3. Great reduction in the floor space necessary.
4. Tonnage cost the same, with the elimination of the high depreciation of cast iron boxes.

### Experimental Procedure

A characteristic sheet of 20-gage (0.0375-in.) thick extra-deep-drawing automobile fender stock was used in this investigation. The percentage analysis of the sheet was:

| | C | Mn | S | P |
|---|---|---|---|---|
| End | 0.06 | 0.39 | 0.024 | 0.008 |
| Center | 0.07 | 0.41 | 0.035 | 0.009 |

Differences in the analysis were due to segregation in the ingot. Also, the carbon content was slightly lower than was reported on the ladle analysis of the heat, indicating that the sheet chosen represented a position in the lower half of the ingot. The sheet was cut into middle and end portions.

Due to the fact that the X-rays revealed a noticeable difference in the structure of the center and end specimens, all samples used weer taken from one position in the sheet—the end. The sheets were then normalized in an electric furnace, the temperature being measured with a pyrometer indicator with an automatic electrically compensated cold junction, in conjunction with a calibrated platinum, platinum-rhodium thermocouple. It was assumed that the sheets were at the temperature indicated by the thermocouple at the center of the furnace.

Oxidation of the sheet in the furnace was prevented by pieces of charcoal near the steel. Oxidation during cooling was overcome by using a cooling chamber into which a small stream of nitrogen was constantly admitted. By means of a differential gage, the nitrogen was admitted at the same rate during all of the coolings.

However, it was felt that the cooling which the steel received by this method made the process differ slightly from that of true normalizing. This was later verified by Erichsen values. Hence, in the final work, the samples were removed from the furnace and cooled in air, the resulting scale being removed by easy grinding when necessary. The scale so formed was rather too thick for a pickling operation.

### Summary of Results

1. Increased soaking time allows the atomic planes to orient themselves into their normal alinement in the space lattice, thereby eliminating internal strain. The grain growth was slight.

2. Increased preheating period has no effect on the crystal structure.

3. Directional properties are not entirely eliminated even with a soaking time of 7 min. at 1800 deg. F.

4. No lattice dimensional changes took place from the heat treatment.

5. The length of the edge of the unit cube of iron was found to be 2.89 A., corresponding favorably with the accepted value of 2.87 A.

6. A temperature of 1700-1750 deg. F. was

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# THE FORGING OF RUSTLESS ST

**SOMETHING of the care required in successful forging of rustless steel is brought out in this article, which indicates the close limitations under which the operator has to work. He is between the Scylla and Charybdis of a temperature which will burn the steel and one at which working will make it "redshort." Because of this fact, some operators prefer to do the trimming after the steel has been annealed and allowed to cool.**

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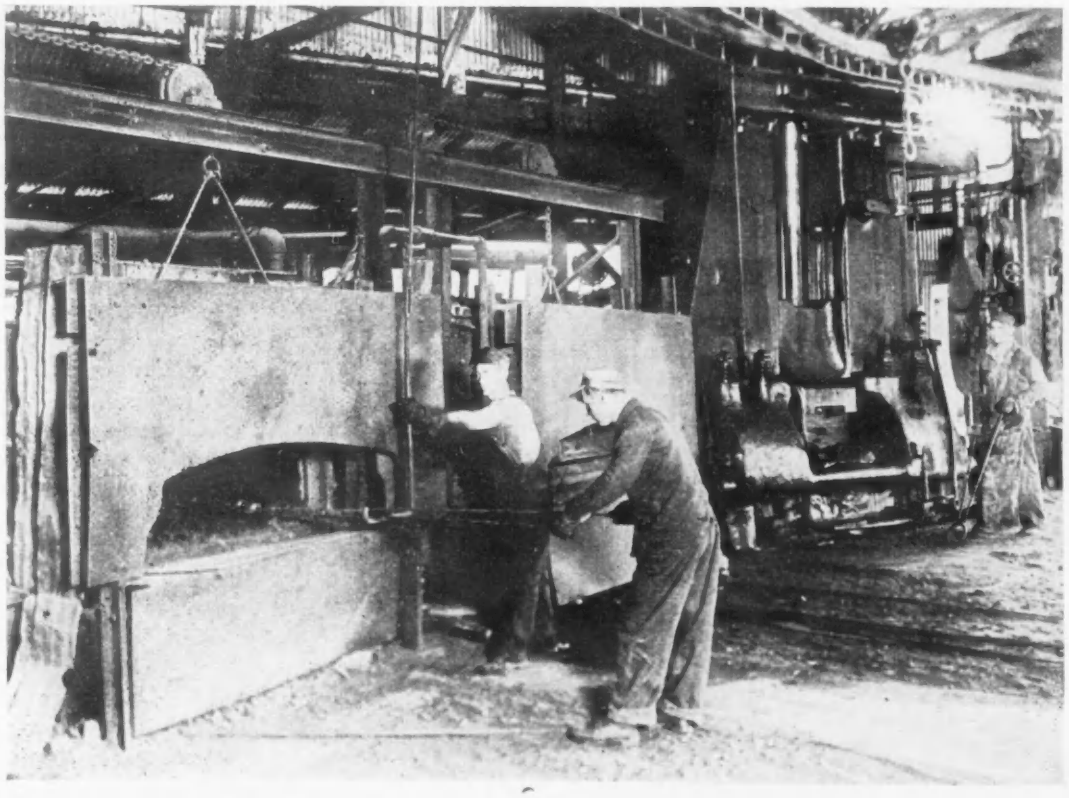
RUSTLESS or corrosion-resisting steels are, as a rule, difficult to forge and hard to machine. These steels, or alloys, include the chromium-nickel and chromium-silicon series and also those containing chromium only. They cover a wide range of analyses, and slight variations in the percentages of alloying metals cause rapid and diverse changes in the physical characteristics. Recently, however, the problem of rendering these steels more easily machineable has been solved by adding a greater amount of sulphur. But their successful forging still depends upon a difficult technique, both in heating and in forming.

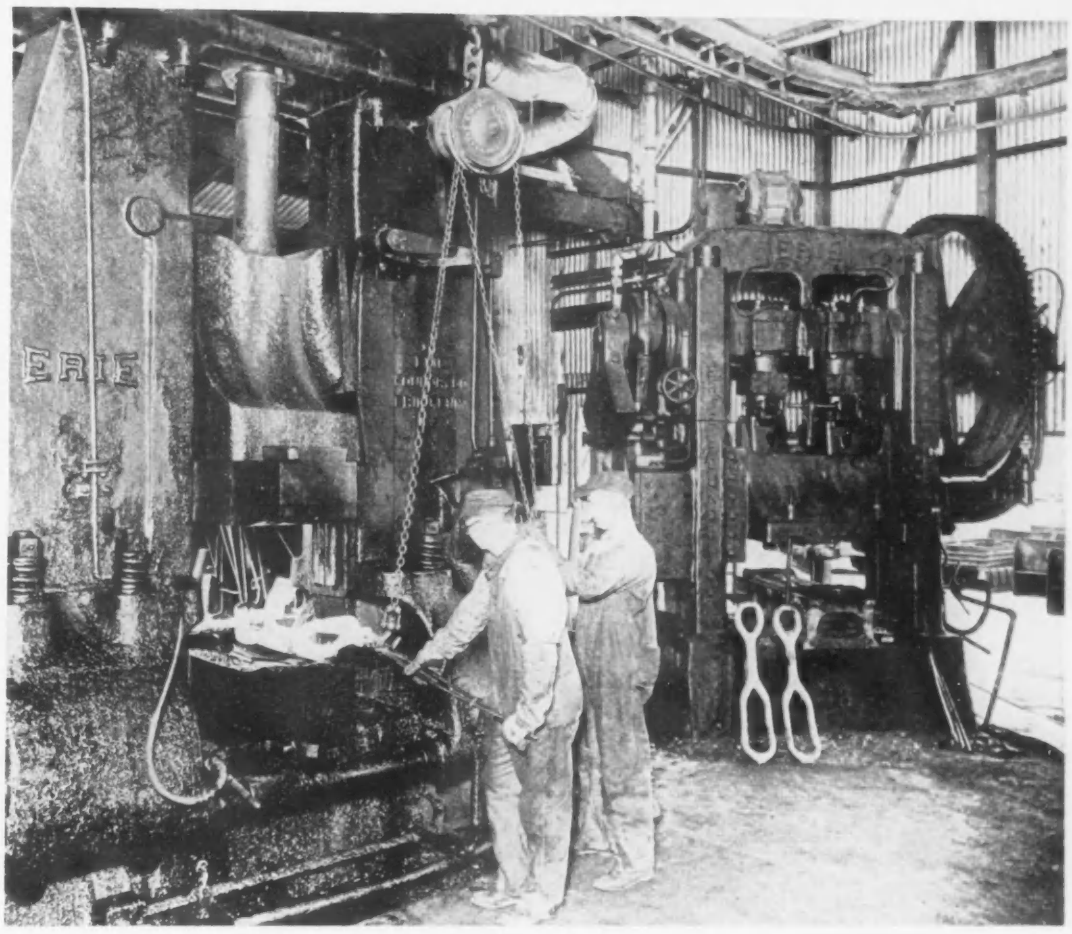
Ordinary steels are easily forgeable at red heats of 1400 deg. F. and up, and the forging pressures necessary for different-size jobs can easily be estimated. When chromium or chromium and nickel are added, in the amounts required in stainless alloys, the pressures necessary for forging jump rapidly—200 or 300 per cent or more.

Practically all the rustless alloys are of high tensile strength, even after they are carefully annealed to a low Brinell hardness, and offer great resistance to machining. The addition of greater amounts of sulphur to the 0.12 per cent carbon = 13 per cent



PREHEATING and high-heat gas-fired forge furnaces serving the power hammer at right. The preheating furnace is in left foreground.

SS STEEL




STEAM drop hammer of 10,000 lb., with trimming press at right. The hammer is forging Kelly bars.

chromium steel has done much in the advancement and use of rustless steel.

Alloys of the KA2 type are, however, still in the "hard to machine" class, and favorable machining properties can be produced only through very accurate heat treatment and close control of forging temperatures.

With the advent of the "free machining" rustless steels, the problem of forging these steels became two-fold. Not only must the forge shop consider the fact that it is dealing with an expensive alloy requiring very close control in forging to prevent loss of the rustless and high physical properties, or injure the metal due to improper heating, but now enters the problem and fact that these free machining steels are "red short" or brittle at temperatures in or slightly below the forging range.

Considerable experimental work on these steels has been conducted by the Western forge plant of the General Metals Corpn., Los Angeles. This research was conducted by W. A. DeRidder, vice-president and general manager, and R. S. Smith, metallurgist. They established the fact that forging of rustless steel requires a thorough preheating in a controlled furnace, separate from but adjacent to the forging furnace, the preheating requiring at least twice as long as for carbon steels.

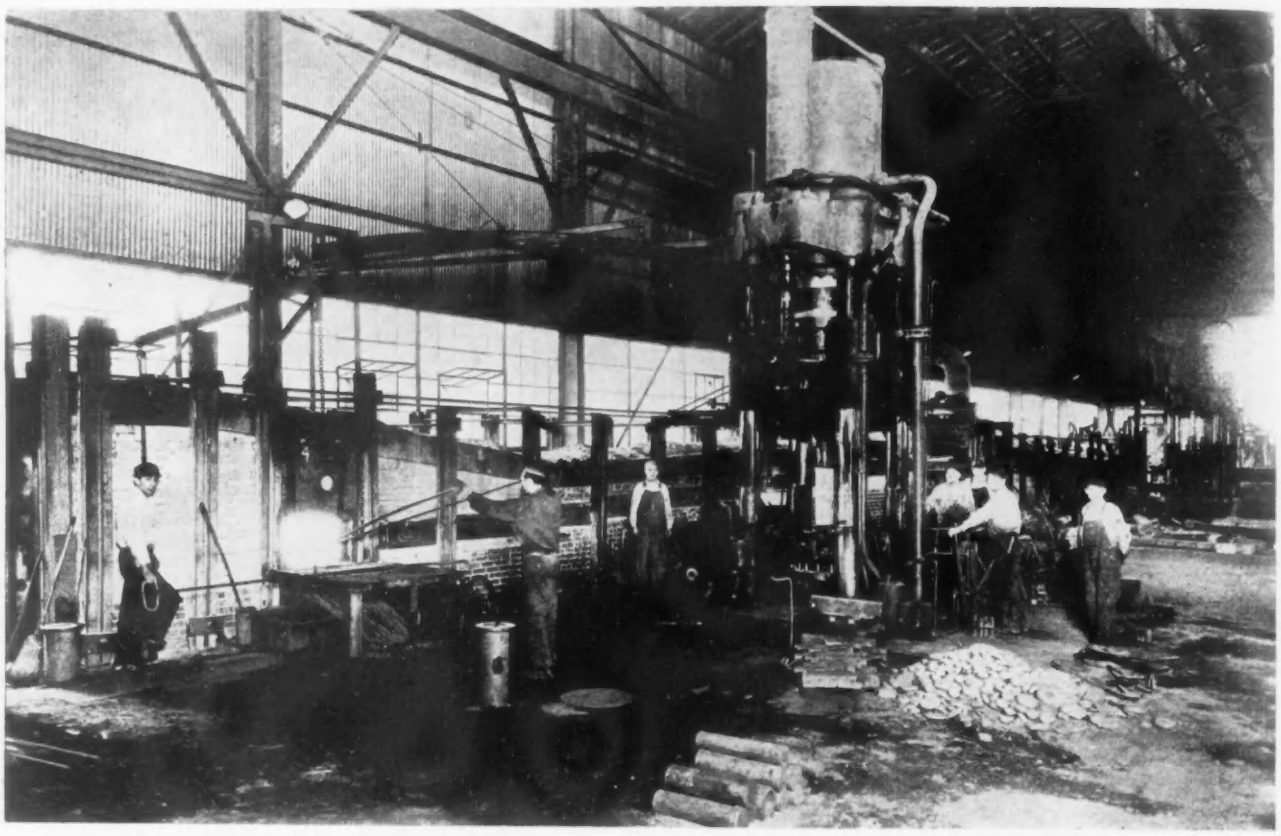
A definite line of demarcation between the preheat and forging heat is controlled by keeping the preheat temperature below the carbon precipitation point for the nickel steels, and just under the grain growth range for the chromium steels. Rapidity in heating in the second furnace, and during reheats while working, is a vital factor in forging and second only to exact control of temperature.

Making rustless steel golf club heads has been successfully worked out in this plant. The analysis of the steel employed is:

| | |
|---|---|
| Carbon | 0.12 per cent maximum |
| Chromium | 11.50 to 14.00 |
| Manganese | 0.50 maximum |
| Molybdenum | 0.25 |
| Silicon | 0.50 maximum |
| Phosphorus | 0.025 maximum |
| Sulphur | 0.40 to 0.50 |

While the high sulphur content makes this a free machining steel, it also imparts red shortness, which causes the steel to tear if trimmed too cold. Practice here has shown that this steel must be forged within a temperature range of 2350 to 2400 deg. F. and the heat must not be allowed to go below 2000 to 2050 deg. F. while trimming. These golf club heads are forged in a four-stage die and then trimmed.

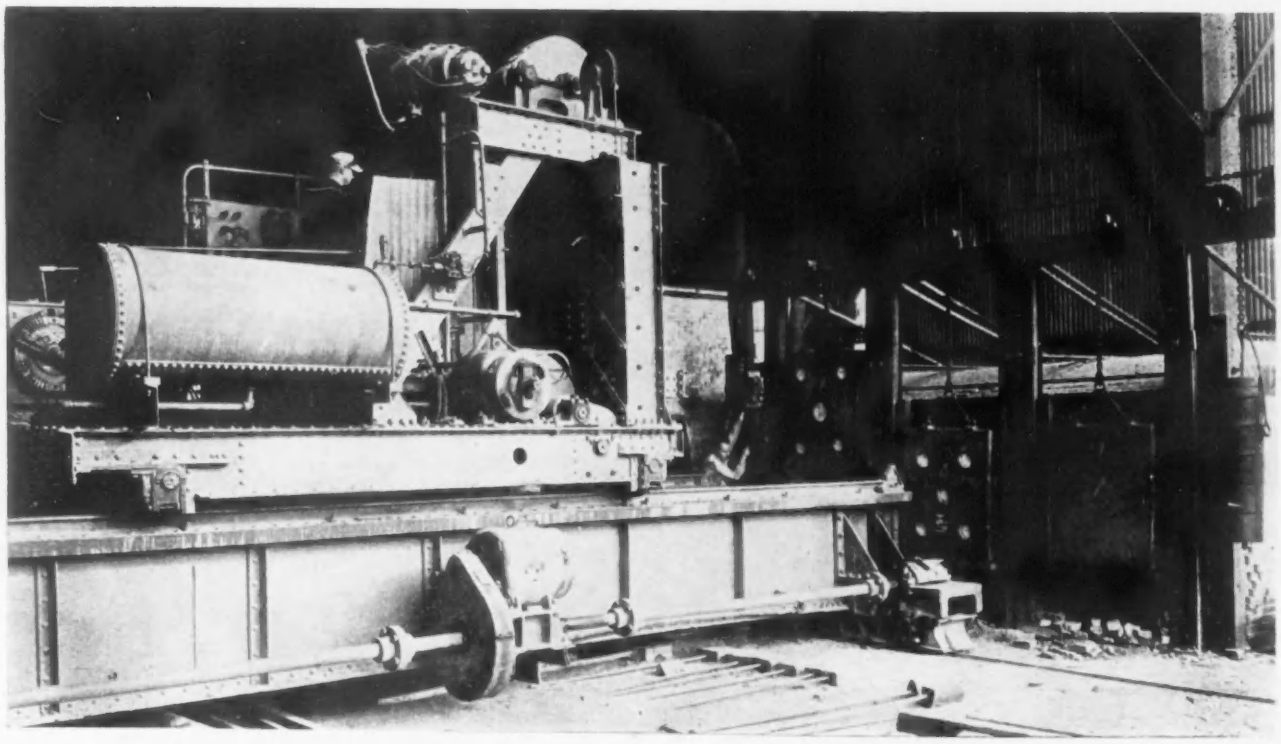
With very accurate control it is possible to use this method with great success. But the risk is great when tem-



Two extruding or piercing presses, each served by a long, continuous, gravity-feed forging furnace for heating the billets, discharging them through a side door.

peratures are not automatically controlled, as the forging temperature is very near the melting point or "burning" point of forging. Below 2000 deg. F. the forgings are exceptionally brittle or "red short," and will break or tear if trimmed hot.

Through later experimenting it has been found that forging this type of steel can be done with greater success at temperatures of 2100 to 2200 deg. F. and then cold-trimmed after a very accurate anneal at 1600 deg. F. and slow cool. This renders the steel exceptionally soft, but gives very good trimming and machining properties. The last-named



Mechanical billet handler, operating on track in front of gas-heated furnace and serving 1000-ton open-front steam press.

method is the most economical, due to the increased production possible when cold-trimming, and to the fact that the forgings must be annealed anyway to produce machining properties.

Chrome-nickel steels of the 18 and 8 series are used in this plant in making welding flanges weighing up to 300 and 400 lb., with analyses as follows:

| | |
|---|---|
| Carbon | 0.07 per cent maximum |
| Manganese | 0.35 to 0.70 |
| Silicon | 0.30 to 0.70 |
| Chromium | 17.00 to 20.00 |
| Nickel | 8.00 to 10.00 |
| Phosphorus | 0.25 maximum |
| Sulphur | 0.25 |

Billets of this analysis cannot be forged at temperatures below 1800 deg. F. nor above 2150 deg. F., and require three reheats during forming. As the volume of product made is too small to warrant the expense of sinking dies, the work is performed in an open frame hammer and includes forming, piercing and upsetting the flange. At all times during the forging of this type of alloy a metallurgist is on duty with an optical pyrometer to make sure that the forging at no time drops below 1800 deg. F. A single cold check could send $100 worth of metal to the scrap pile, or cause later failure of the product when in service.

Some of the products made here include large gear blanks and crankshafts, fishtail bits of any size, steel shafts up to 45 in. in diameter, large drill collars, Kelly bars up to 60 ft. in length, mandreled rings up to 5 ft. long and 5 ft. in diameter. The plant has a complete die sinking and machine shop, and is divided into two main divisions—drop forge department and press forge department.

### Separate Furnaces for Individual Hammers

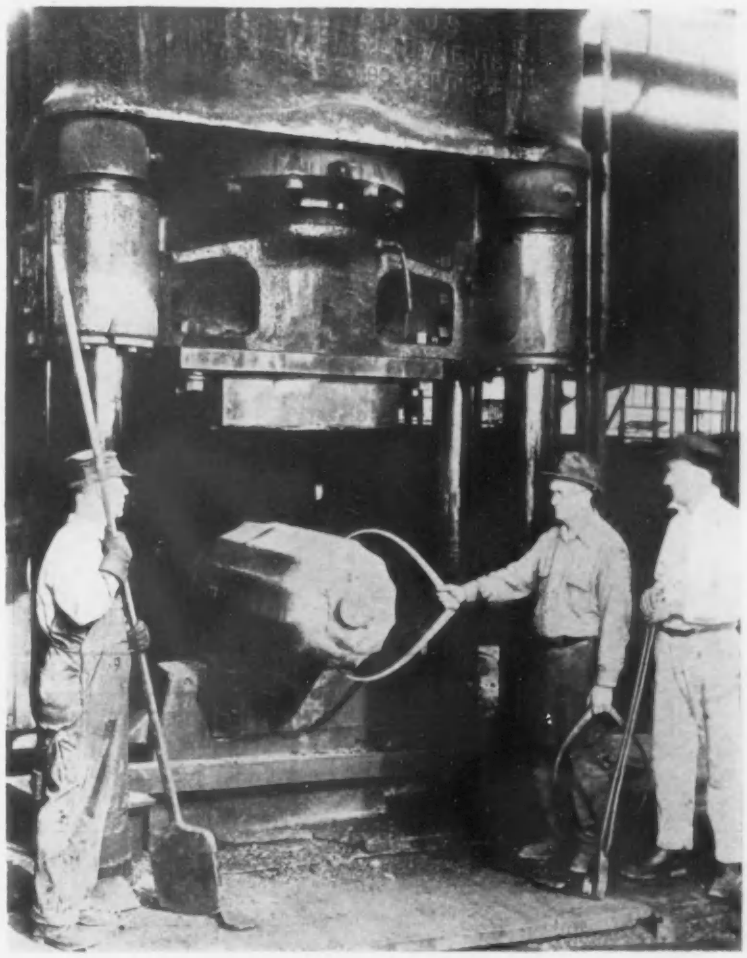
In the drop forge department each small hammer is served with a gas furnace, while the large hammers have two each, one for preheat and the other for high heat. The smaller furnaces are of the slot type, brick construction and steel-incased, the hearths of chrome ore laid in the plastic state from 3 to 4 in. thick. The furnaces are 4 ft. square and 6 ft. wide (outside dimensions) and stand on 3½-ft. legs. Each is fired with a single gas burner on each side and has an indicating pyrometer. An air pipe with ports is located along the under lip of the slot, and a sliding shield covers the slot when not in use.

Two furnaces, serving the largest hammer, are just alike—of the slot type and brick and steel construction, but without legs. Each is 7 ft. deep, 7 ft. high and 9 ft. in width and is heated with a single gas burner on each side, staggered so as not to fire against each other. A portable indicating pyrometer aids in controlling temperature. One of these furnaces is used for the preheat and the other for the high heat.

Three furnaces serve the 1000-ton billet forging press, for it requires as much as 30 hr. to heat some of the large billets. Press and furnaces are all arranged in a single row, and a 5-ton billet manipulator operates on a track of 25-ft. gage.

Two of these furnaces are on one side of the press and one on the other. They are of brick and steel construction, each being about 18 ft. wide, 10 ft. deep and 6 ft. high (outside dimensions) and heated with two gas burners firing from one end. There are three openings in the front of each, closed with steel counter-weighted doors. Air preheaters are provided for two of these furnaces and indicating pyrometers are used on all.

While the chromium alloys are in process of forging at this plant the hot metal is under constant observation by operators with optical pyrometers. The steel is returned to the furnace for a reheat as soon as the temperature drops to the allowable limit. Scale is another difficult factor; an operator is always watching for its formation and immediately removes it lest it be forced into the metal.



Open-front steam press of 1000 tons capacity, operating on a hot ingot of the round fluted type.

A three-door furnace similar to the one described serves the open-frame forging hammer. In this case a third of the interior space is divided off from the rest of the furnace with a refractory brick wall. The smaller portion, used as a preheat chamber, is kept hot with waste heat from the high-heat chamber.

Billets ranging from 4 to 12-in. in diameter, formed hot in the big hydraulic extrusion presses, are heated in two large furnaces of the gravity-feed and side-

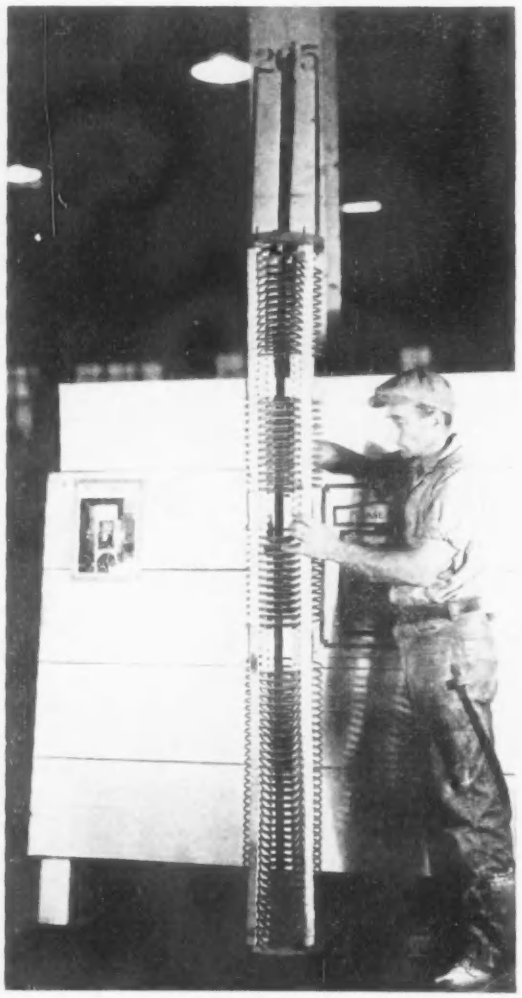
(*Concluded on page* 1584)

# USE OF DISSOCIATED AMMONIA IN ANNEALING

SELECTION of the kind of gas to be used is a matter of utilization and results to be obtained. There may be several different kinds of gases which may be used for a given process. Happily, from both a cost and a utilization point of view, these gases fall into the same relative position as to desirability, as follows:

1—Dissociated ammonia
2—Dissociated butane
3—Dissociated natural gas
4—Dissociated artificial gas
5—Hydrogen
6—Dissociated methanol

In studying the bright annealing problem, means had to be developed for studying these gases, both in the raw and in the dissociated conditions, and the effect produced by them on various grades of iron and steel throughout the complete temperature range of heat treatment. To make the condition still more complex, combinations of these gases were studied also, for the purpose of arriving at the best possible solution for a particular problem. Equipment next had to be developed for the production or dissociation of these gases, and for their purifying and dehydrating.



A SPECIAL hood or cover for the charge was designed, which not only would fit over the outer surface of the charge, but extend down on the inside of the coiled material, permitting the use of an internal heating element, removable with the bell. The internal or center heater is shown here, being a modification of a standard unit.

All this research and development work, when combined with parallel developments in connection with electric furnaces, has made possible the control of the finished product to a high degree of accuracy, resulting in a continuous, uniform, high-grade product at a net saving said to range from $1.50 to $3.50 a ton, compared with existing methods.

Any appreciable reduction in the time required in the annealing cycle is of importance. An analysis of this will disclose that electric annealing will provide the following, all other things being equal:

1. A reduction in floor space requirements of approximately 50 per cent.
2. A reduction in gas consumption for atmosphere control of approximately 50 per cent.
3. Getting the material through the heat-treating department in one-half the time, resulting (a) in having the product in course of manufacture a correspondingly shorter period, (b) in quicker deliveries, and (c) in earlier collection of the purchase price for the product.

An investigation of the great majority of bright annealing operations now using fuel furnaces will disclose the following economic advantages, if electric furnaces with controlled atmosphere, of suitable type and construction, are used:

1. Reduction in heating costs.
2. Reduction in maintenance.
3. Reduction in labor.
4. Improved annealed product.
5. A surface free from discoloration.
6. Reduced annealing time or cycle.
7. Less floor space required.
8. Reduction in rejects.
9. Fewer complaints from customers.
10. Less worry in the plant as to the kind of product that will be obtained.
11. A definitely controlled product.
12. Production of a definite, uniform, high-grade product at a considerable reduction in factory cost.

It has been pointed out already that one of the most difficult problems to solve in connection with bright annealing was that of the action of different gases on metals, a determination of which gases were the most suitable, and means for obtaining such gases at as low a cost as possible.

The first consideration is that, whatever gas is used, it must be as free from impurities as possible,

# AS ATMOSPHERE
# STRIPS AND SHEETS

By WIRT S. SCOTT
Special representative
Westinghouse Electric & Mfg. Co.
Mansfield, Ohio

**ACTION of gases on metals, aside from mere discoloration of surface, is here treated in connection with electric furnaces and controlled atmospheres for annealing of strip and sheet steel. This is the concluding installment of an article on this topic.* The author shows how anhydrous ammonia, dissociated, may be used to advantage in producing an atmosphere in which annealing can be carried on, without danger of damage to the surface of the steel under treatment.**

and it must be dry. Fundamentally, nitrogen is the perfect gas to use, since it is perfectly neutral, and has no effect whatever on the work being annealed or on the container. Nitrogen will cause neither oxidation nor surface decarbonization. Where an oxide is already present on the work, it may be desirable to use a reducing gas, in which case hydrogen with a carbon content may be required.

To meet this situation, it has been necessary to develop equipment for obtaining a suitable supply of pure nitrogen and hydrogen, together with other combined gases, such as may be required by the particular application. The raw gases from which the pure gases are made may consist of ammonia, butane, natural or artificial gas and methanol.

### Whence to Obtain Satisfactory Nitrogen

Since nitrogen appeared to be the most desirable of all gases for a large percentage of the applications to be encountered, this investigation naturally took the channel of determining, among other things, the source of nitrogen which would give the lowest cost, always bearing in mind that the gas should be free from impurities.

This investigation led to the consideration of the use of pure ammonia, or "anhydrous ammonia," as the chemist terms it. It has long been known that anhydrous ammonia may be dissociated or "cracked" directly into its component elements through the reversal of the conditions required for its synthesis, producing free nitrogen and hydrogen gases in an uncombined state. The product so formed consists of a mixture of 75 per cent by volume of hydrogen and 25 per cent by volume of nitrogen.

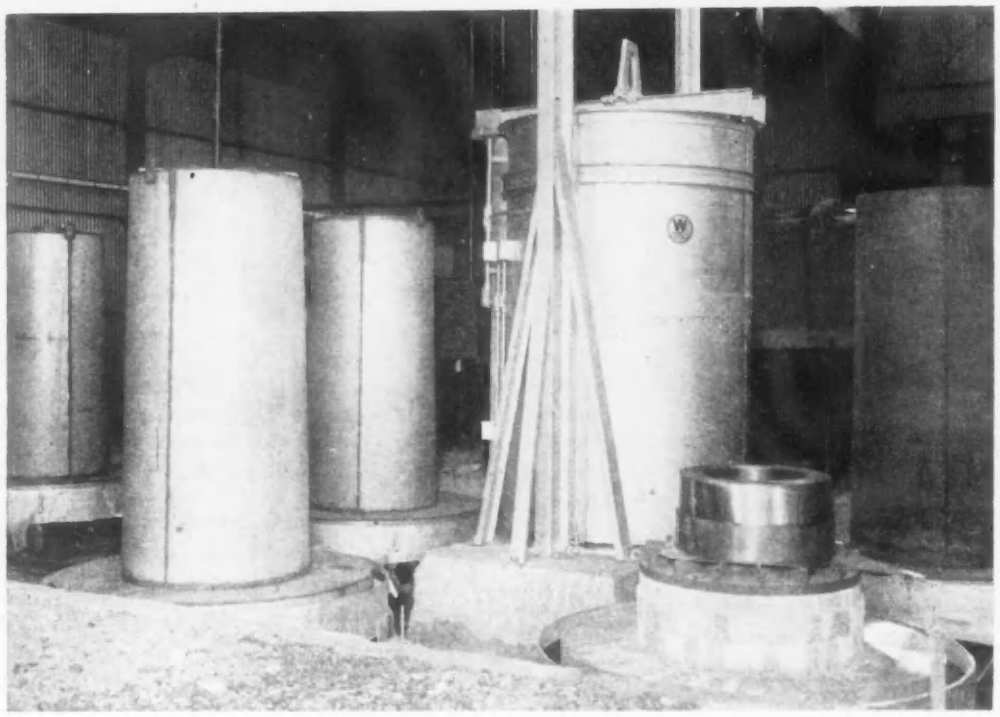
Offhand, it might appear questionable economy to take ammonia and dissociate it, particularly when one considers that it is the undoing of what had already been accomplished in the chemical plant, i.e., the uniting of nitrogen and hydrogen. But there is far more than this involved. The necessity for using pure gases for the controlled atmosphere has been stated repeatedly. Where ammonia is manufactured in large quantities, very costly equipment and elaborate means are employed for purifying the hydrogen before combining it with nitrogen. Hence the resulting product is perhaps the purest form in which these elements may be commercially obtained.

One pound of anhydrous ammonia vaporized at atmosphere pressure and room temperature occupies 22.7 cu. ft. On dissociating, this yields 45.4 cu. ft. of gas containing 34 cu. ft. of hydrogen and 11.4 cu. ft. of nitrogen.

A standard ammonia cylinder contains 100 lb. of anhydrous ammonia, which on dissociation will

**THREE bell-type electric furnaces under construction, preparatory to shipment. Each furnace is rated at 90 kw. and is capable of bringing a charge of steel up to a temperature of 1400 deg. F. in 8 hr. The cooling cycle is approximately 24 hr., with gas flowing over the charge under the cover. These furnaces are for continuous bright annealing of cold-rolled strips.**

*The first article appeared in THE IRON AGE of Dec. 3, page 1422.



INSTALLATION at Bopp Steel Co., Detroit, for continuous bright annealing of cold-rolled strip. This installation consists of a cylindrical bell-type furnace and six movable bases. The furnace is shown in the position of heating a charge; the three covered charges at the left are cooling; one charge is in process of being loaded on the base; the one at extreme right is ready for the furnace. This furnace accommodates a charge of 7500 lb. Maximum outside diameter of coil, 32 in.; minimum inside diameter, 16 in.; maximum height of charge, 72 in.

yield 4540 cu. ft. of dissociated ammonia, containing 75 per cent hydrogen and 25 per cent nitrogen. When purchased in cylinders and tank cars, the ammonia will cost approximately as follows:

| | Cylinder Lots | Carload Lots |
|---|---|---|
| Ammonia, 100 lb. ..... | $16.00 | $6.00 |
| Rate per 1000 cu. ft. gas.... | 3.53 | 1.32 |

Dissociated ammonia is produced by passing ammonia vapor over a catalyst heated to approximately 600 deg. C. (1112 deg. F.). The ammonia vapor dissociates into one part pure nitrogen and three parts pure hydrogen. Where pure hydrogen and nitrogen form a desirable atmosphere, this procedure presents an economical solution to the problem.

Where nitrogen alone is required, it may easily be obtained by burning the dissociated ammonia in a closed combustion chamber with the correct amount of air, the products of combustion being nitrogen and water. Drying this gas will result in pure nitrogen.

Burning 8 volumes of dissociated ammonia with nearly 15 volumes of air will result in approximately 14 volumes of nitrogen. In other words 100 lb. of ammonia, on dissociation and subsequent burning with air, will yield over 7800 cu. ft. of nitrogen.

### Quantity of Gas Needed

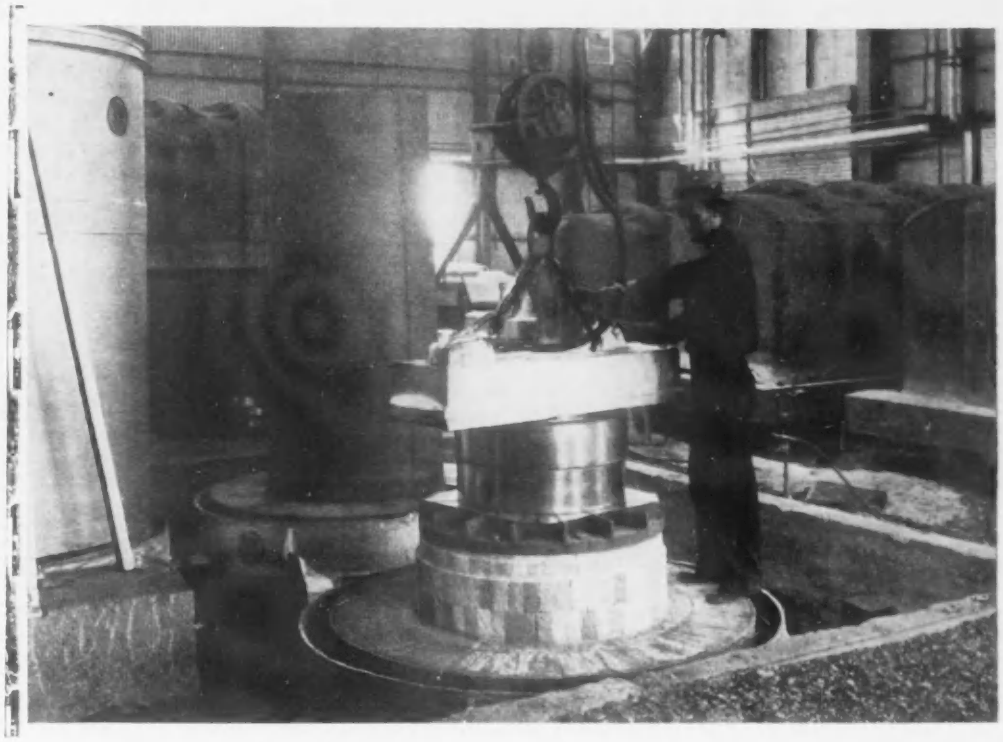
Probably the next question which comes to one's mind, after all this discussion, is "how much gas an hour is required for the ordinary charge?" The answer to that is as follows:

For a 7000-lb. charge, in a furnace of the cylindrical bell type, 25 cu. ft. of gas an hour was sufficient, over a series of tests.

For a 15,000-lb. charge, in a furnace of the rectangular bell type, 50 cu. ft. of gas an hour was sufficient, over a series of tests.

From 6 to 8 cu. ft. of gas an hour per ton of

FOURTEEN bell-type annealing furnaces, installed in one plant of the American Rolling Mill Co. Each furnace has an electrical capacity of 170 kw. and is designed for 1950 deg. F. operation. Overall dimension of each furnace, 10 ft. 5½ in. wide, 15 ft. 3½ in. long, 11 ft. 5½ in. high. Net weight of charge, 25 to 30 tons.



PLACING the charge of cold-rolled strip on one of the bases, using a magnetic hoist. This charge is stacked to a height of approximately 72 in. before the cover is placed over it.

product bright annealed will be a fair estimate of the requirements.

Installation of properly coordinated units is absolutely necessary for the production of a high-grade product.

A proper working unit must consist of:

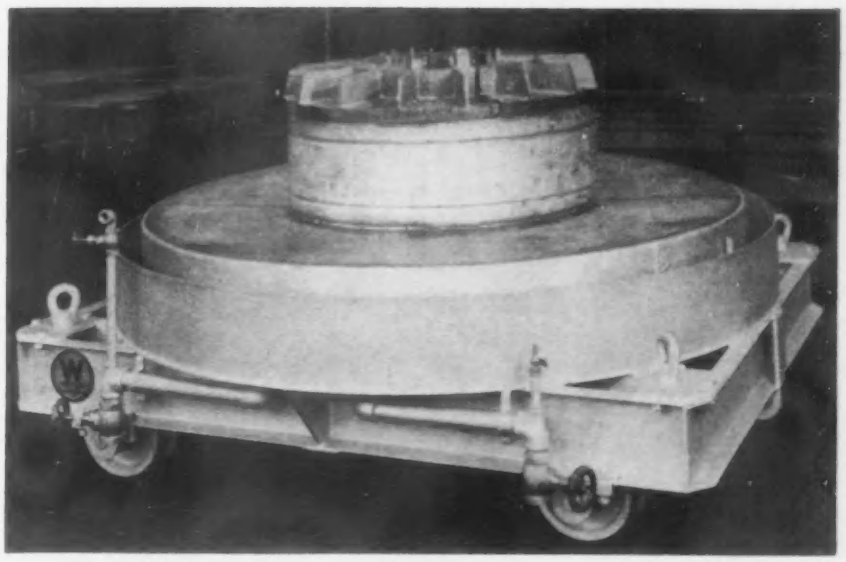
1.—A suitable atmosphere gas for the particular material being heat treated, taking into consideration the chemical analysis of the iron or steel, the extent of its cleanliness upon reaching the annealing furnace, and the ductility of product desired.

2.—A suitable dissociation of cracking process, having means for:

a. Indicating the quality and production rate of the gas.
b. Accurately maintaining a predetermined flow and proportion of incoming gases.
c. Effectively drying the gas.
d. Keeping the catalyzer at a proper temperature.
e. Maintaining proper preheating conditions of the incoming gases.
f. Automatically adjusting the input of raw gases to correspond with the demand for finished gases.
g. Give notice of any departure from normal conditions.

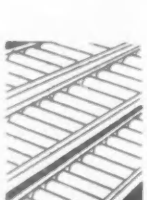
3.—An electric furnace or furnaces of a design such as will produce the quality of product desired at the lowest possible overall costs. Such a design must take into consideration the following:

a. Tonnage of material to be handled in 24 hr.
b. Kind and shape of material to be heat treated.
c. Material-handling facilities.
d. Floor space available.
e. Power rate available.
f. Pounds of material heat treated per kwhr.
g. Probable maintenance on the kind of equipment selected.
h. Total investment for the complete installation.



WHERE the action of the gas on the refractory materials of the base is apt to cause discoloring of the charge, the base is completely inclosed in a welded nickel-chromium sheet structure as shown here. The heavy castings at top of base are to support the charge. These castings are made also of nickel-chromium alloy. The construction of the liquid seal, also the pipe connections, is shown.

# CONVEYOR SYSTEM WITH TURN TA



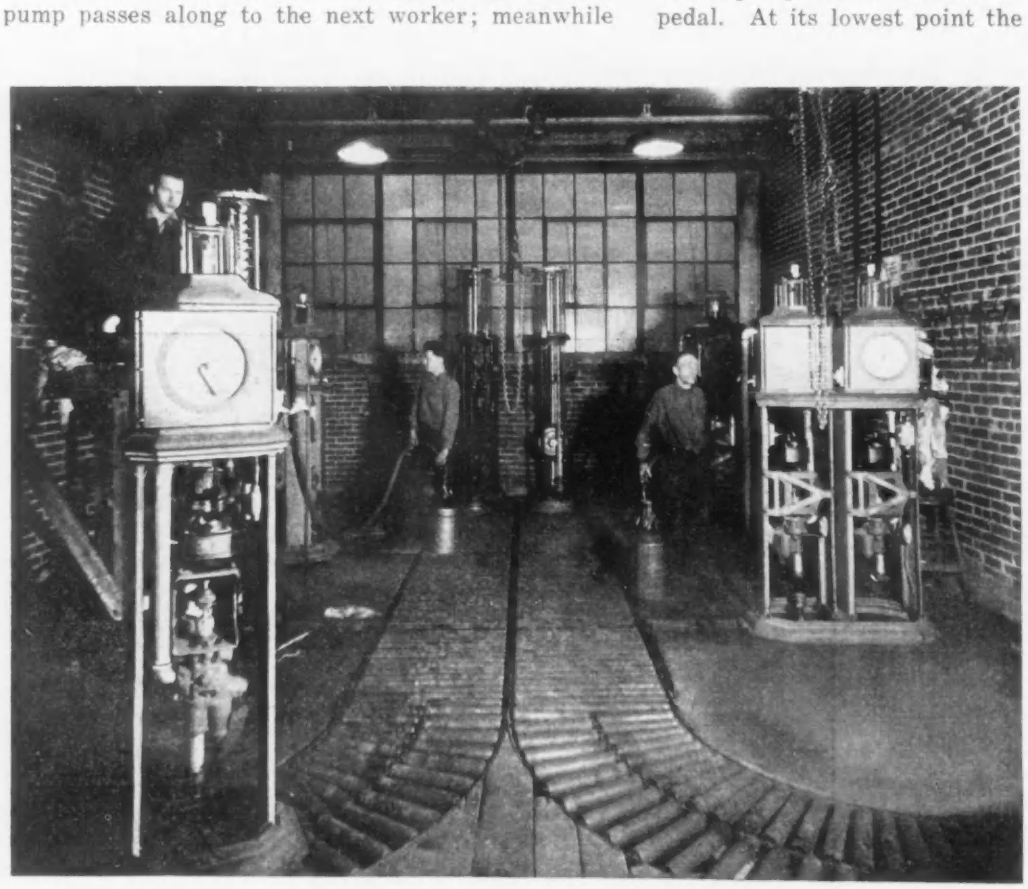
By A. M. KERR
Engineer, Mathews Conveyer Co.,
Ellwood City, Pa.

IN the plant of the Pennsylvania Pump Co. at Pittsburgh are manufactured thousands of the familiar gasoline pumps that stand like sentinels at the corner service stations. Here production has been put on a basis assuring speedy and economical operation and enabling the manufacturer to make the units on a quantity basis.

Intelligent application of conveyors has been made, to handling the product from the first assembly operations through to the shipping department. Work progresses in orderly style, one operation following another without delay as the conveyor carries on toward its final destination, where the product will be complete and ready for shipment. A worker finishes his job on a certain pump and the pump passes along to the next worker; meanwhile the first man turns and finds another pump has moved up to take the place of the one which he has just sent on.

Pace-setter and economizer, the conveyor system in this plant has accomplished things impossible with ordinary handling methods. The whole system is set at floor level and runs in a U-shape down one side of the assembly building and back on the other side.

At the start of the conveyor line an air lift sunk in a pit has a roller conveyor section as its top. It stops at about waist-high level and a workman places on the rollers a large casting which is the base of a pump. After he fastens on the vertical side pieces of the pump he releases the hoist by means of a foot pedal. At its lowest point the hoist alines its own



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TESTING floor, where pumps are handled on roller conveyor to speed up this operation.

# N TABLES FOR ASSEMBLING PUMPS

HOW a small installation of conveyors in a manufacturing line can spur production and reduce costs is told in this article. The whole line is perhaps 50 ft. long, not counting the extensions to testing and painting departments. This is merely another illustration of the way the smaller plant is adopting the methods of large-scale producers.

rollers with those of the assembly line, the structure of the pump is moved off and begins its journey around the U.

**Roller Conveyor Turntables Speed Assembly**

Every few feet, along the assembly line of roller conveyor, is a roller conveyor turntable upon which some assembly operation is carried out. A pump moves on to a turntable which is lined up with the fixed conveyor. Then by means of a foot pedal the operator at the assembly station releases the lock and turns the table into the position, which makes it most easy for him to work upon the pump. When his operation is completed, the worker returns the table to its original position and the pump moves down the conveyor to the next station. And so the assembly progresses around the U-shaped conveyor line, starting with bases and rapidly growing into finished pumps.

At the end of the assembly line, the pumps continue on the conveyor to the inspection department. Here a roller conveyor frog section is fixed into the main line so that any defective assemblies can be quickly shunted off. This feature is unusually effective, as it eliminates any need of holding up production while defects are removed from the line.

**Test Floor Served by Conveyors**

Now, the conveyor carries the pumps on to the testing floor where, by means of special testing equipment, the pumping capacity of each unit is measured. This test must show each pump capable of a predetermined number of gallons a minute. Failure to measure up to the standard means return of the pump to the assembly department.

Following production on down the conveyor line, the pumps receive first a flat coat of paint and then, proceeding to the spray paint booths, the finishing coat is applied. The spray paint booths are equipped with roller conveyor turntables similar to those in the assembly line. These permit the spray paint operators to rotate the pumps as they paint them.

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GASOLINE pumps are assembled on this U-shaped roller conveyor, equipped with turntables at each assembly station. At left is the hoist section, on which the uprights are assembled to the base, starting the production line.

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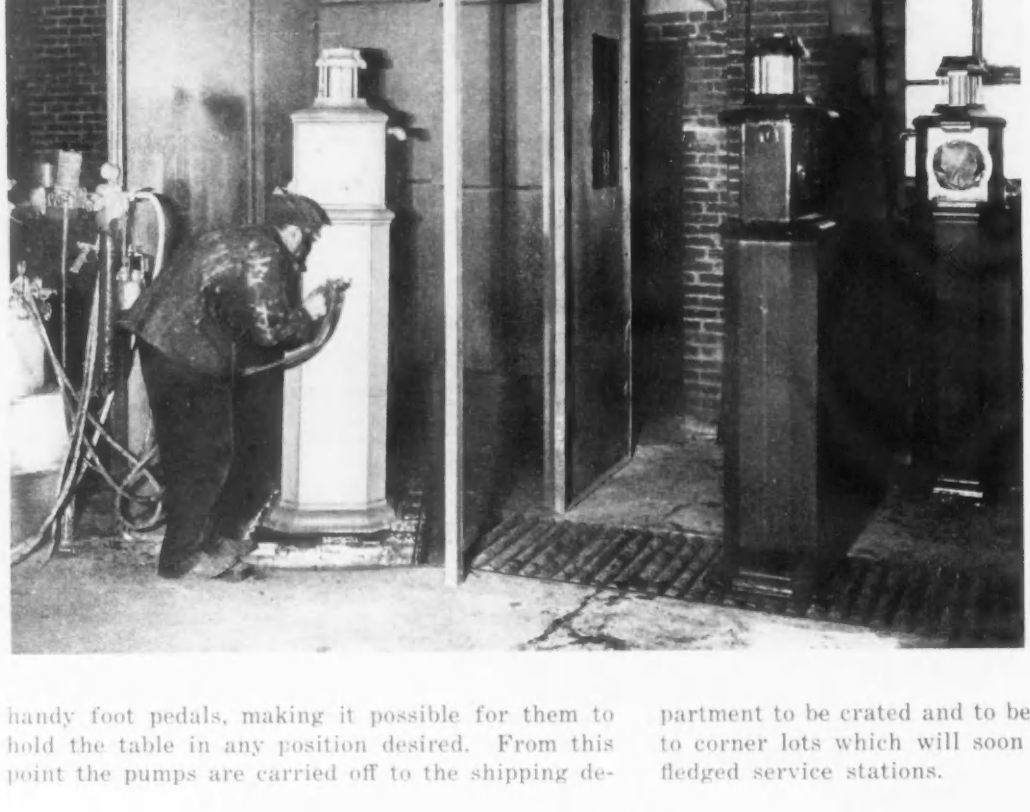

PAINT spray booths are served by roller conveyor. Spraying is simplified by means of roller turntables built into the line, which permit pumps to be rotated as desired.

handy foot pedals, making it possible for them to hold the table in any position desired. From this point the pumps are carried off to the shipping department to be crated and to be loaded for shipment to corner lots which will soon blossom out as full-fledged service stations.

# Decarburizing Action of Fused Salt Baths

THE decarburizing and erosive action of various salt baths, such as are used in steel hardening, on cylindrical specimens 1 in. long by ½ in. in diameter of a steel analyzing 0.84 per cent C, 0.03 per cent Si, 0.25 per cent Mn, 0.02 per cent P and 0.03 per cent S has been investigated by A. Seuthe and E. Schulz (*Stahl und Eisen*, June 25, 1931). Samples were exposed for ½, 1½, and 3-hr. periods at a series of temperatures between 1500 and 2000 deg. F. either in an open platinum crucible or in an atmosphere of nitrogen. The influence of the pure salts and pure salt mixtures was as follows:

*Decarburization in Open Salt Baths*

| | Decarburization, Per Cent | | Weight, Loss in Per Cent | Decarburization Depth, Per Cent |
|---|---|---|---|---|
| | 0.02 In. Border | Mean of Specimen | | |
| 1:1 $NaCl$-$BaCl_2$ | 12.1 | 2.71 | 2.06 | 0.058 |
| 1:1 $NaCl$-$KCl$ | 17.5 | 4.02 | 2.82 | 0.076 |
| Pure $NaCl$ | 18.5 | 3.99 | 2.83 | 0.080 |
| 1:1 $CaCl_2$-$BaCl_2$ | 24.2 | 5.00 | 1.32 | 0.140 |
| 1:1 $NaCl$-$CaCl_2$ | 30.5 | 5.10 | 2.30 | 0.120 |

Decarburization of the surface and of the total specimen increase in the same order on the average, which agrees with that of the depth of the decarburized layer as determined microscopically. After removal of the encrusted salt and oxide layer, a dark coating of iron oxide was apparent. Both the weight loss and the decarburization increased with increasing temperature and exposure.

The erosive action of the alkaline earth salts appears to be less than that of the alkali salts. With the exception of $NaCl$-$BaCl_2$, the greatest decarburization occurred with the least erosion. Perhaps ferrous oxide forms a protective layer. In pure nitrogen atmosphere none of the baths produced noticeable decarburization, showing that access of atmospheric oxygen is a most important factor; a little erosion was observed. Further tests were made with known additions of the principal impurities of the commercial salts and with additions of ferrous and ferric oxide, as shown in the following table:

| | NaCl | | | | | $NaCl$-$BaCl_2$ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Add'n | $Na_2SO_4$ 0.25% | $Na_2SO_4$ 0.5% | FeO 0.5% | $Fe_2O_3$ 0.5% | Pure NaCl | $Na_2SO_4$ 0.25% | $Na_2SO_4$ 0.5% | FeO 0.5% | $Fe_2O_3$ 0.5% | Pure $NaCl$-$BaCl_2$ |
| Carbon loss, per cent, 0.02-in. border | 42 | 36 | 30 | 33 | 23 | 37 | 26 | 24 | 29 | 8 |
| Total specimen | 14 | 8 | 5 | 6 | 4 | 13 | 6 | 4 | 5 | 2 |
| Weight loss, per cent | 7 | 8 | 2½ | 3 | 3 | 6 | 7 | 2 | 2½ | 2 |

The marked effect of the sulphate addition in these 1½-hr. tests ($MgSO_4$ was also tested) indicates that the sulphate probably reacts with the iron, forming iron sulphide and setting free oxygen which decarburizes the metal. The presence of iron oxides had little effect in these baths exposed to the air, both oxides having about the same influence on decarburization. Experiments in a nitrogen atmosphere showed that free oxygen has several times the effect of combined oxygen.

Decarburization is caused principally by oxygen from the air dissolved in the molten salt (gas is evolved when the salt cools). As the iron oxide content of the bath increases with its age, the oxide also becomes a factor in decarburization.

# Rustless-Steel-Lined Copper Utensils Are Finished with Arc-Welded Edge

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**EITHER rustless steel or tin-lined copper vessels are considered highly desirable for cooking in hotels and restaurants. A method of combining the high-chrome nickel alloy and copper, obtaining a liquid-tight joint on the edge by arc welding, has been developed by a New York manufacturer of culinary equipment.**

▼▼▼

TO provide a cooking utensil with maximum heat conductivity in contact with the flame and complete acid resistance in contact with food, a Long Island City, New York, manufacturer, the Joseph Heinrichs Corpn., has combined copper and rustless steel.

These utensils, called by the maker Bimetal, are drawn from No. 18 B & S gage chrome-nickel alloy steel with an outer shell of No. 12 B & S gage hot-rolled copper sheets. These gages have been adopted by the company as a shop standard to avoid the confusion likely to occur in a plant where a wide range of metals specified in different gage standards are handled. Included in the materials used largely in the form of sheets for restaurant equipment are copper, brass, silver, nickel, nickel silver and rustless steel.

In forming a Bimetal utensil, the rustless steel lining is first drawn, a depth of about 6 in. being obtained before the first annealing is necessary. When completed, the container is thoroughly pickled and cleaned, but grinding and polishing are not necessary. It is then placed in the center of a circular blank of copper and the completed rustless steel lining and the blank for the outside copper coating are drawn together cold. As the second die is but little larger than the first, the two pieces of metal are forced together closely and the top edge is then trimmed and finished.

### Welding Adopted for Tight Joint

In preliminary experiments with this type of utensil, the inner shell of rustless steel was curled over the outside coating of heavy copper, but this finish on the edge did not provide the needed tightness of joint required in a cooking vessel and welding was suggested by the Pressed & Welded Steel Products Co., Long Island City, a manufacturer of special metal products.

As a result, the outer shell of copper and the inner lining of chrome-nickel alloy steel were arc welded along the edge with a 1/16-in. coated alloy rod of the same analysis as the lining. With this edge welded into a liquid-tight joint, the bead was removed by hand grinding and polishing, and tests demonstrated that moisture which had accumulated when the edge was only rolled, had been eliminated. A tight joint was essential, as moisture might seep between the inner and outer shell and tests showed that under cooking heat the moisture expanded into steam, in certain cases forcing the two parts of the container far apart.

### Copper Globules Appear in Weld

Although, in welding the rustless steel and copper coating, slight streaks and globules of copper appear in the finished edge, they are not considered of importance as the copper at that point is not in direct contact with food while cooking. Handles on certain utensils are of cast nickel silver and are attached to the copper jacket by silver solder, capable of withstanding temperatures up to 1500 deg. F., which is higher than any temperatures developed by a cooking flame.

It is pointed out by the manufacturer of these utensils that the two metals are considered by chefs as the most satisfactory for heat conductivity and acid resistance. Copper distributes the heat more evenly than other metals used for cooking vessels and rustless steel is most satisfactory for resistance to food acids.

While the coefficients of heat expansion of copper and rustless steel differ, the fact that the two metals are actually attached only at the welded edge of the utensil evidently permits the necessary expansion and contraction under heat.

The maker suggests the Bimetal utensil as an improvement over copper lined with tin coating, which has been so widely used in the past and is still considered to be among the most satisfactory utensils for hotel and restaurant use.

# HEATING REFRACTORIES FROM

By M. H. MAWHINNEY
Electric Furnace Co., Salem, Ohio

IT is frequently desirable to know how long it will take to bring a furnace up to operating temperature and how much fuel will be used in the process. The purpose of this article is to outline the conclusions derived from a series of practical tests performed for the purpose of determining this information.

Fig. 1 shows the relation between time required

**Table I—Time Required to Heat Up**

| Final Temperature Deg. F. | Cu. Ft. of Gas an Hour | Heat Liberated, B.t.u. per Sq. Ft. Hourly | Time to Reach Operating Temperature |
|---|---|---|---|
| 1000 | 500 | 3,900 | 4.7 hr. |
| | 750 | 5,830 | 1.8 hr. |
| | 1000 | 7,800 | 1.1 hr. |
| 1200 | 500 | 3,900 | 8.5 hr. |
| | 750 | 5,830 | 2.8 hr. |
| | 1000 | 7,800 | 1.9 hr. |
| 1400 | 500 | 3,900 | 15.0 hr. |
| | 750 | 5,830 | 4.8 hr. |
| | 1000 | 7,800 | 2.5 hr. |
| 1600 | 500 | 3,900 | 23.0 hr. |
| | 750 | 5,830 | 7.7 hr. |
| | 1000 | 7,800 | 5.2 hr. |

for heating up and heat liberated in the furnace for each square foot of interior area, as found by these practical tests.

In determining data for Fig. 1 the procedure followed was, briefly, the liberation of different quantities of heat per hour at different times in the same test furnace under identical conditions, and the measurement of temperature rise with respect to time. The data so obtained were then checked with values obtained from tests of a number of commercial furnaces of different types in practical operation.

Before proceeding with the details of this investigation, it is desirable at this point to outline the factors which affect the heat absorption under heating-up conditions. These are:

1. What heat storage exists in the refractories when the furnace is considered "up to temperature" and ready for operation?

2. What is the effect of the final operating temperature on the time and fuel required to heat up?

3. What effect do the wall thickness and amount of insulation have on the time and fuel required for heating up?

4. What is the effect of variation in the rate of heat liberation, as contrasted with a steady rate of heat liberation throughout the heating up?

5. What is the relation between time and fuel required for heating of furnaces of different construction and to different operating temperatures?

### *Tests with Steady Rate of Heat Liberation*

THESE tests were carried out in a furnace which is 6 ft. wide x 5 ft. deep x 3 ft. 2 in. high to the spring line of the arch, all dimensions being inside the furnace. There is a door opening 3 ft. 5 in. wide x 2 ft. 9 in. high on the front of the furnace and three natural-gas burners fire directly into the chamber from one side. Vent flues are in the sidewalls, with ports at hearth level. Temperature is measured by six thermocouples projecting through the backwall and distributed over the cross-sectional area.

Into this furnace, at different times, gas was fired at the rates of 500, 750 and 1000 cu. ft. an hour, the gas being of 1050 B.t.u. per cubic foot calorific value. With these rates of firing the time required to bring the average of the six thermocouples to several different temperatures was determined as shown in Table I.

**Table II—Rate of Heat Liberation**

| | B.T.U. per Sq. Ft. Hourly | | | |
|---|---|---|---|---|
| Time, Hours | Test No. 13 | Test No. 14 | Test No. 21 | Test No. 23 |
| ½ | 3,120 | 8,400 | 5,200 | 1,670 |
| 1 | 2,600 | 10,200 | 5,200 | 6,700 |
| 1½ | 2,910 | 6,750 | 5,200 | 4,440 |
| 2 | 2,760 | 7,000 | 4,900 | 5,500 |
| 2½ | 2,760 | 7,150 | 5,650 | 5,950 |
| 3 | 2,910 | 7,150 | 4,730 | 6,250 |
| 3½ | 2,910 | 6,700 | 6,250 | 5,950 |
| 4 | 2,580 | 5,800 | 5,650 | 5,200 |
| 4½ | 2,410 | 5,800 | 5,500 | 5,350 |
| 5 | 2,250 | 5,050 | 5,650 | 5,020 |
| 5½ | 2,250 | 5,030 | 5,500 | 5,800 |
| 6 | — | 5,030 | — | — |
| Average heat liberation | 2,678 | 6,672 | 5,635 | 5,203 |
| Final temperature, deg. F. | 900 | 1,600 | 1,600 | 1,550 |
| Time, hours | 5½ | 6 | 5½ | 5½ |
| Average gas hourly, cu. ft. | 350 | 875 | 740 | 680 |
| Ratio heat liberated / radiation loss | 1.10 | 2.6 | 1.68 | 1.70 |
| Radiation loss, cu. ft. of gas, hourly | 250 | 440 | 440 | 400 |

Data from Table I are shown by the dotted lines of Fig. 2.

# "COLD" IN FUEL-FIRED FURNACES

**THIS is the first of a series of two articles dealing with the absorption of heat by the refractory lining of furnaces or other apparatus which is heated by the gases resulting from the combustion of a fuel. The present article is concerned with the heat absorption while the empty furnace is being heated to operating temperature, which must be considered in the determination of the overall fuel economy of any heating equipment. The second article will be devoted to the heat absorption during practical operation.**

To afford a better idea of these rates of firing, the fuel required to maintain this furnace at 1500 deg. F. after it has been at temperature for about 10 hr. is 360 cu. ft. of gas an hour, so that for the 1500 deg. F. dotted curve of Fig. 2, the ratios of heat liberated to this radiation were 1.39, 2.08 and 2.78 respectively. With a radiation requirement of 250 cu. ft. gas an hour at 1000 deg. F., the ratios of heat liberated to radiation for the three tests shown on the 1000-deg. curve were 2.0, 3.0 and 4.0 respectively.

These values of radiation are about twice the values for true radiation for steady stated conditions, because after 10 hr. the walls are still absorbing a great deal of heat; but they are selected as a basis for comparison because so few industrial furnaces are operated continuously for a sufficient time to reach an equilibrium condition.

These tests are for constant rates of heat liberation over the entire period of heating up, whereas in practice the rate of firing is usually high, and frequently the full maximum capacity of the burners, at the start. The heat is then turned down gradually as the furnace heats up. Most industrial furnaces are equipped with automatic control which operates in the same manner, because, when the furnace gases reach the desired temperature, the control alternates between the high and a low fuel rate while the refractories approach furnace temperature.

The variable method would seem to be the quicker and the more efficient method of attaining heat storage adjacent to the inside surface of the refractory lining, and such values are more representative of commercial operating practice. To determine the difference between the two methods of operation and a curve of more practical value, tests in large number were performed in the same test furnace.

### *Tests with Varying Rate of Heat Liberation*

OF 14 tests in this furnace, in all of which the furnace was heated up rapidly and in the manner usual in furnace operation, four examples have been selected for detailed outline of data, as indicated in Table II.

From the sample tests in Table II and the other tests with varying conditions, the heavy lines in Fig. 2 were drawn for the 1000 and 1500-deg. lines. As no test in the test furnace was carried above 1650 deg. F., the 2000-deg. line was determined from the commercial furnace tests discussed below.

While the tests in Table II were for a hand-controlled furnace, they follow about the same values as would hold for automatic control. At the rates of firing of the examples, the heat liberation is about constant for the first 4 hr. and drops off in the last 1½ or 2 hr. For lower rates the period of constant heat liberation would be somewhat longer in propor-

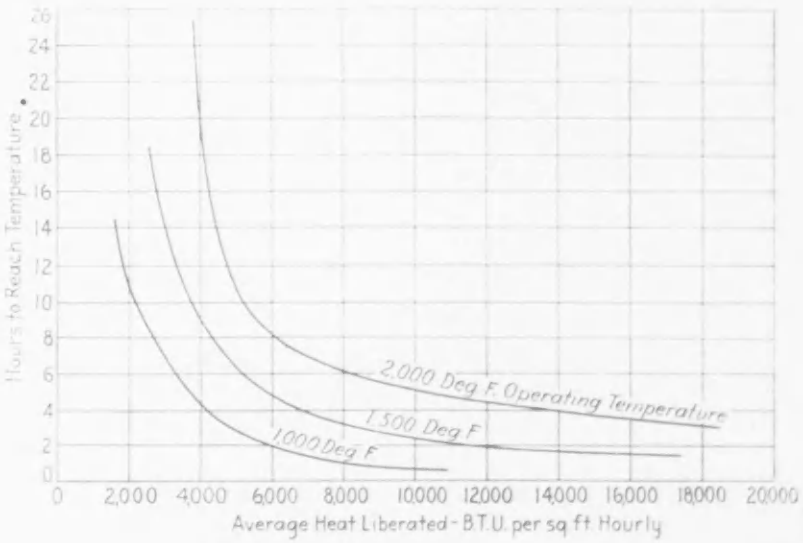



Fig. 1.—Time required to bring a heating furnace to working temperature drops sharply as more heat is liberated in the furnace each hour.

**Table III—Tests in Commercial Furnaces**

| Furnace Type | Operating Temperature Deg. F. | Fuel | Interior Area, Sq. Ft. | Average Heat Liberated per Sq. Ft. B.t.u. Hourly | Time to Heat, Hours | Ratio Liberation Radiation | Walls: Fire Brick In. | Walls: Insulation In. |
|---|---|---|---|---|---|---|---|---|
| Car-type annealing | 1350 | Natural gas | 1,200 | 8,300 | 2 | 3.86 | 9 | 5 |
| Batch rolling mill | 1900 | Oil | 312 | 14,800 | 4 | 1.10 | 18 | 2½ |
| Chain-hearth heat treating | 1500 | Natural gas | 228 | 3,500 | 11 | 1.52 | 7 | 10 |
| Tunnel kiln | 1500 | City gas | 540 | 2,040 | 23 | 1.40 | 13½ | 7½ |
| Rotary hearth | 1900 | Natural gas | 1,760 | 5,550 | 8 | 1.15 | 13½ | 2½ |
| Batch forging | 2300 | Oil | 318 | 8,100 | 7 | 1.2 | 22½ | 2½ |
| Continuous pusher carburizing | 1600 | Natural gas | 305 | 5,900 | 5½ | .... | 9 | 10 |
| Continuous pusher forging | 2300 | Natural gas | 295 | 23,700 | 4½ | .... | 13½ | 2½ |
| Pusher billet heating | 2200 | Natural gas | 1,014 | 8,200 | 6 | .... | 18 | .... |
| Batch forging | 2200 | Coke oven gas | 26 | 42,000 | 1¾ | .... | 9 | 5 |

tion of total time, and for higher firing rates the opposite would be true.

From a study of the corresponding dotted and solid lines of Fig. 2, it is evident that a furnace may be brought up to temperature more quickly by firing hard at the start and dropping the fuel input as the furnace lining approaches the desired temperature than is possible by firing at a constant rate equal in value to the average of the variable rate. With the same hourly rate and a shorter time, it is therefore more economical, from the standpoint of fuel economy, to fire hard at first.

**Table IV—Total Heat Required**

| Rate of Heat Liberation B.t.u. Sq. Ft. Hourly | Hours to Heat, From Curve | Heat Used B.t.u. per Sq. Ft. |
|---|---|---|
| 2,000 | 23 | 46,000 |
| 4,000 | 9 | 36,000 |
| 6,000 | 5 | 30,000 |
| 8,000 | 3.2 | 25,600 |
| 10,000 | 2.5 | 25,000 |
| 12,000 | 2.0 | 24,000 |
| 14,000 | 1.8 | 25,200 |
| 16,000 | 1.6 | 25,600 |
| 18,000 | 1.5 | 27,000 |

On account of turn-down limitations, gas-fired furnaces are frequently equipped with burners of just sufficient capacity for the maximum demand when in commercial operation. It may be shown that auxiliary burners, to be used only for lighting up, are a good investment in many cases. An example is worked out at the end of this article.

### *Tests in Commercial Furnaces*

IN commercial furnace tests identically the same procedure was followed as in the experimental furnace tests with variable input of heat. During the routine heating up of various furnaces from cold the time and fuel consumption were determined when the furnace was apparently hot throughout, which was usually from 1 to 2 hr. after the control thermocouple had reached the desired temperature. A summary of the data is given in Table III.

From the data afforded by these tests and others of similar nature, the solid line for 2000 deg. F. in Fig. 2 was drawn. The solid lines in Fig. 2 are the same as those of Fig. 1, which represents the curves for use when considering practical cases where a furnace is operated with variable fuel rate when heating up.

It is noticeable that those practical commercial results which involve furnaces heated to 1500 deg. F. check very closely with the curves derived from the experimental furnace.

#### How to Use the Data

As an example of the use of the curves of Fig. 1, suppose that a batch furnace, underfired with natural gas, is 5 ft. wide x 20 ft. long x 2 ft. high from hearth to arch skew line, and is used for heating rods at 1800 deg. F. The furnace is to be heated empty from cold to operating temperature, and the question is, how long will it take?

If the maximum capacity of the furnace is 5000 lb. an hour and it burns 1.4 cu. ft. of gas per pound at this capacity, the maximum demand when operating will be 7000 cu. ft. gas an hour. Suppose that the burner capacity available is 10,000 cu. ft. an hour and the inside area, including doors at end and combustion chamber under the hearth, is 380 sq. ft., then the maximum rate of heat liberation is

$$\frac{\text{10,000 cu. ft. an hour x 1000 B.t.u. per cu. ft.}}{\text{380 sq. ft.}} =$$

26,000 B.t.u. per sq. ft. hourly and the average rate

**Table V—Effect of Wall Construction**

| Wall: Fire Brick in. | Wall: Insulation in. | Steady Heat Liberation B.t.u. per sq. ft. hourly | Temperature at 2 in. depth at different furnace temperatures: 1000 | 1200 | 1400 | 1600 | Percentage at different furnace temperatures: 1000 | 1200 | 1400 | 1600 |
|---|---|---|---|---|---|---|---|---|---|---|
| 4½ | 10 | 3,900 | 630 | 950 | 1220 | 1420 | 63 | 79 | 87 | 89 |
| | | 5,830 | 530 | 740 | 980 | 1260 | 53 | 62 | 70 | 79 |
| | | 7,800 | 320 | 500 | 740 | 1190 | 32 | 42 | 53 | 74 |
| 9 | 5 | 3,900 | 620 | 900 | 1180 | 1360 | 62 | 75 | 84 | 85 |
| | | 5,830 | 520 | 720 | 900 | 1200 | 52 | 60 | 64 | 75 |
| | | 7,800 | 300 | 495 | 750 | 1150 | 30 | 41 | 54 | 72 |
| 13½ | 2½ | 3,900 | 640 | 940 | 1220 | 1400 | 64 | 78 | 87 | 88 |
| | | 5,830 | 520 | 740 | 1000 | 1220 | 52 | 62 | 72 | 76 |
| | | 7,800 | 300 | 500 | 760 | 1150 | 30 | 42 | 54 | 72 |

while heating up may be about 20,000 B.t.u. per sq. ft. hourly. From the curves of Fig. 1, by interpolation, the time will be about 2½ hr.

The effect of the rate of heat liberation is indicated by the commercial furnace tests, Table III, where the chain hearth furnace and the tunnel kiln required 11 hr. and 23 hr. respectively to heat, on account of a low rate of heat liberation. The comparative economy of different rates may be obtained from Fig. 1 and tabulated as in Table IV, which is for furnaces at 1500 deg. F.

From this tabulation, the most efficient rate is 12,000 B.t.u. per sq. ft. hourly.

As an example, consider the case of the chain-hearth furnace in Table III. This furnace required 11 hr. with a heat liberation average of 3500 B.t.u. per sq. ft. hourly. The maximum demand in this furnace when heating a maximum of 900 lb. is 900 cu. ft. of natural gas an hour and the inside area is 228 sq. ft. The burner capacity is 1200 cu. ft. an hour, or a liberation of 5300 B.t.u. per sq. ft. an hour.

For 11 hr. and 3500 B.t.u. per sq. ft. an hour, corresponding to a consumption of 800 cu. ft. of gas an hour, the gas used was 8800 cu. ft. At maximum burner capacity with 5300 B.t.u. per sq. ft. liberated an hour, the time to heat up is 6 hr., and the total fuel is 7200 cu. ft. Now, if additional burners were installed to be used only for heating up, and with a capacity such that the maximum input was 2750 cu. ft. an hour or 12,000 B.t.u. per sq. ft. an hour liberated, the time would be 2 hr. and the total gas used would drop to 5500 cu. ft. This is a saving of 1700 cu. ft. and the economy made by the additional burners depends on the number of times the furnace is heated from cold in a year.

## *Effect of Wall Construction*

INTIMATELY connected with the question of whether or not a furnace is heated up quickly is the amount of heat stored in the refractory lining, as measured by the temperatures through the thickness of the lining. With the thought of having a numerical idea of the comparative heating, in addition to the testimony and judgment of visual inspection, records of wall temperatures were made in all of the tests on which this article is based, and extending over the two-year period.

Three different wall constructions present in this furnace were selected, and thermocouples were buried in these walls at different depths. By means of a rotary switch, readings of these thermocouples were taken at intervals throughout all tests. For each test a curve was plotted for the temperature distribution in each of the walls at the time the furnace was considered as heated up, which are the times given in Fig. 1.

Rather than reproduce these curves for each test, it was decided that the temperature taken from each curve at a point 2 in. from the inside of the furnace would accurately express the relative heat storage in the walls. The heat stored beyond a depth of 2 in. from the inside would be of little value in offsetting the drop tending to occur when a cold charge would be put into the furnace. By dividing the temperature at 2 in. depth by the final temperature of the furnace, a percentage is obtained which serves as a comparative index of the heat storage. The values of this percentage are given in Table V.

Examination of Table V indicates that practically no difference exists in the heat storage values for the different wall thicknesses given, which include the majority of furnace walls. The close agreement in these heat penetration figures for different times of heating with different rates of firing demonstrates that the heating up of a furnace is practically independent of the wall construction. This has already been indicated by the agreement in performance of different commercial furnaces of widely varying wall constructions with the curves derived from tests in the experimental furnace.

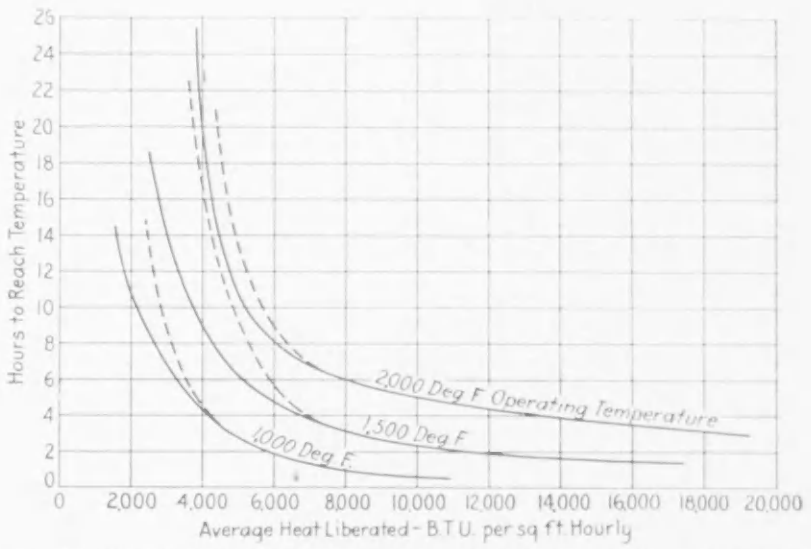



Fig. 2.—Dotted lines show that heating up the furnace with constant heat input, instead of great heat input at start, takes more heat hourly for the same total time or a longer time for the same hourly heat input.

Tests with variable fuel rates gave the same values as Table V for the same average rates of heat liberation.

## *Conclusions*

A NUMBER of interesting conclusions might be outlined on the basis of the data developed in these tests. The principal conclusions as outlined in this article may be summarized as follows:

1. An industrial furnace to be operated at an average temperature of 1600 deg. F. is "heated up" when the temperature of the lining at a depth of 2 in. from the inside is 75 per cent of the furnace temperature.

(*Concluded on page* 1584)

# USE OF TUNGSTEN CARBIDE AND OTHER HARD CUTTING-TOOL MATERIALS GAINING

MORE extensive use of tungsten carbide and other hard cutting tool materials was shown in the progress report presented by the sub-committee on metal-cutting materials of the special research committee on the cutting of metals of the American Society of Mechanical Engineers at that organization's annual meeting in New York recently. This report, the third submitted by the committee, was read at the machine-shop practice session, Nov. 30, by Coleman Sellers, 3rd, executive engineer, William Sellers & Co., Philadelphia, and secretary of the sub-committee.

The progress indicated refers not only to increase in the number of users, but also to the more extensive use by many firms that had used hard cutting materials previously. The questionnaire upon which the present report is based was sent out last April, or 13 months after the previous questionnaire; it was sent to a number of leading manufacturing plants.

Of the 100 replies, 85 gave information included in the present report. Tungsten-carbide tools are used by 73 of the reporting firms. The percentage of total operations carried on with these tools varied up to 48 per cent, but only 20 firms used them for more than 5 per cent of their operations. Use of cobalt high-speed steel was reported by 45 plants, which, however, used it for a higher percentage of their operations. Tantalum carbide was reported by seven plants and stellite by 53 plants. Nine companies reported use of diamond cutting tools.

Operations for which tungsten and tantalum carbides are being successfully used were reported as follows: Forming, 80 plants; boring, 62; planing, 11; milling, 14; drilling, six; sawing, one; and shaping slots, one plant. At the time of the last questionnaire, March, 1930, only lathe and planer applications were reported.

As to the types of material on which tungsten carbide is used, 69 plants use it successfully on cast iron; 46 on bronze; 23 on aluminum alloys; 14 on soft steel and 12 on hard steel. Other materials included malleable iron, vanadium iron, 50 per cent semi-steel, asbestos, Bakelite, stellite, high-speed steel, and stainless steel. With tantalum carbide, there were 14 that reported success on steel; four on bronze, three on aluminum alloys, five on cast iron and one on stellite.

### Importance of Proper Grinding Recognized

In reference to the grinding of hard cutting materials, the report states that 54 firms reported use of a pedestal grinder, the tool being held by hand; 15 of these used no other method. There were 28 that used a pedestal grinder with the tool clamped on angle-setting slide, 45 used a universal tool grinder, 30 used a surface grinder, 17 used a face-mill grinder, and one used a drill grinder.

Evidently there is no uniformity in the method. It is apparent, however, that the importance of machine grinding is being realized, and the methods have improved since the time of the committee's first report, when only 13 shops reported machine-ground tools.

In answer to the question as to who ground the tools, 41 reported tools ground by machine operator, 21 by tool crib attendant, 35 by grinding-machine operator, and 28 by a specialist. In nine cases the grinding-machine operator was the specialist. Several replied that the machine operator ground high-speed tools and the tungsten-carbide tools were ground by the grinding-machine operator.

Of the 30 firms using 5 per cent or more tungsten carbide, only four reported tools ground solely by machine-tool operator, and one of these was in tool crib. In other words, where they have had sufficient success to warrant the purchase of a number of tools, they realize the importance of careful grinding.

### Grinding Wheel Sizes and Specifications Vary

There were 38 firms that used a straight wheel only in grinding their tools, and of these all but one ground on the periphery; 12 ground on the side of a cup wheel, and 37 used both types. Only one used a disk.

Size of wheels used varied greatly, the minimum being 3¼ in. and the

**Table I—Typical Examples Showing Savings on Engine Lathes**

| Application No. | 1 | | 2 | | 3 | | | 4 | |
|---|---|---|---|---|---|---|---|---|---|
| Material cut | Steel | | Hard bronze | | Cast iron | | | Cast iron | |
| Specifications | S.A.E. 3250 | | .... | | Sil 2.75, Mn 0.50, Brinell 35 | | | Sand-blasted | |
| Cutting quality | Good | | Good | | Hard | | | Hard | |
| Condition of machine tool | Good | | Good | | Good | | | Good | |
| Size of tool, in. | 1¼ × 1¼ × 3 | | ⅝ × 1¼ × 8 | | 3⅜ × ½ × ½ | | | ½ × 1 × 7 | |
| Size of tip, in. | ⅝ × ¾ × ⅝ | | ⅛ × ¼ × ½ | | ⅛ × ¼ × ½ | | | ⅝ × ⅛ × ⅝ | |
| Shape of nose | Square | | Round | | Round | | | Round | |
| Clearance angle, deg. | 6 | | 6 | | 5 | | | 3 | |
| Top side rake, deg. | 12 | | 6 | | 6 | | | 1 | |
| Top front rake, deg. | .... | | 4 | | 10 | | | 7 | |
| Method of mounting | Special holder | | Plain tool post | | Box tool | | | Plain tool post | |
| Operation | Rough turning | | Finish turning | | Rough and finish turning | | | Rough turning | |
| Tool material | T-C | H.S.S. | T-C | H.S.S. | T-C | Cob. | H.S.S. | T-C | H.S.S. |
| Cutting speed, f.p.m. | 150 | 60 | 519 | 362 | 75¾ | | 32¾ | 230 | 120 |
| Feed (per revolution), in. | 0.031 | 0.012 | 0.056 | 0.007 | 0.01 | 0.01 | | 1/64 | 1/4 |
| Depth of cut, in. | ¼ | ¼ | .. | .. | 0.05 | 0.05 | | 1/8 | 1/8 |
| Cu. in. removed per min. | 14 | 2.1 | .. | .. | 0.43 | 0.142 | | 2.3 | 1.2 |
| | Continuous | | Continuous | | Continuous | | | Intermittent | |
| Number of pieces per grind | 18 | 6 | 2000 | 50 | 1500 | 4–6 | | 50 | 10 |
| Number of grinds per tool | .. | .. | 150 | 50 | 12 | 12 | | 32 | 40 |
| Cost of tools | $27.00 | $8.00 | $28.25 | $2.50 | (2)$18 | (2)$0.52 | | $32.50 | $2.00 |
| Time per piece, hours | 0.54 | 0.90 | 0.05 | 0.10 | 0.009 | 0.02 | | 0.065 | 0.112 |
| Savings in labor cost, per 100 pieces | $20 | | $4.55 | | $9.03 | | | $2.91 | |
| Decrease in cost, per 100 pieces, including tool expense | | | 4.55 hr. and $0.36 decrease in tool expense | | $10.015 | | | 15 per cent | |

**TO what extent are tungsten-carbide tools finding practical use in industry? What practices are followed in grinding, lapping and honing hard cutting tools?**

**Answers to these and related questions were given in a report, here abstracted, which was presented at the recent annual meeting of the American Society of Mechanical Engineers. The data presented were obtained from a canvass which was undertaken to determine the present status of the use of tungsten and tantalum carbides and other new cutting materials.**

**While much has been learned from experience with these materials, there is a great need for scientific data regarding their application, says the report.**

maximum 26 in. in diameter. The face varied from ¼ in. to 4 in. The most popular was 10 in. in diameter, as 27 were equipped with that size, 24 used 8 in. in diameter, and 15 used 6 in. in diameter. The remainder were scattered among the various sizes.

As to specifications the grain, grit, and bond varied almost as much as the size of the wheel. Five companies reported using the same grain and grade for roughing and finishing; two of these used universal tool grinders, one used a surface grinder, and the two others used a pedestal grinder. Four of the five used a 60-grain wheel; the other used 80. There were 39 that used a different wheel for finishing than for roughing; 11 specified the wheel for roughing only, and 20 the wheel for finishing only.

For roughing, the grain used varied from 20 to 200 and for finishing from 24 to 220. By far the most popular were 60 to 80 roughing and 100 to 120 finishing.

### Silicon Carbide Abrasive Used

There seems to be little doubt that silicon carbide is the abrasive to use, but the hardness varies, states the report. The majority favored G and H on the scale used by some manufacturers and S and R on the other scale. These four letters represent very little difference in hardness.

In reference to grinding wet or dry, 67 firms use the dry method only, nine grind wet only, and 14 use both methods. Evidently either is acceptable.

The time of grinding varied from 1 min. to 2 hr. for lathe and planer tools, but the majority ran between 3 and 20 min. The time does not mean much unless the size and condition of the edge are known. One prominent manufacturer using a fairly high percentage of tungsten-carbide tools stated that a 1¼-in. square tool would take 5 min. to resharpen if dull. If it was chipped, the time would be 15 min., and for a new tool the first sharpening would take 25 min. Eight other firms stated times from 4 to 40 min. for this size of tool, with the average about 15 min.

Milling cutters required from 15 min. to 10 hr., depending upon the size. Some of these were: 6 in. diameter by 2½ in. face, 27 min.; 8 in. diameter by 1 in. face (20 teeth), 45 min.; 8 in. diameter by 2¼ in., 25 min.; 9 in. diameter (24 teeth), 1½ hr.; 12 in. diameter (36 teeth), 3 hr.

To the question, "Do you have any difficulty with tools cracking from grinding?" most of the answers were negative.

### Honing More Generally Practiced

The section of the report dealing with the lapping and honing of tools gives the following data: Two companies reported lapping all tools, three lapped 75 per cent, and three lapped 50 per cent of the tools, seven more lapped 10 per cent or less, and 31 did no lapping. Of the 15 that lapped, nine lapped finished tools only.

Honing is much more generally practiced. Fifteen firms reported honing all tools, and eight others honed 15 per cent or more. Only seven reported no honing.

Of 37 shops reporting honing, 22 honed both roughing and finishing tools; one honed all roughing tools and lapped all finishing tools; one reported honing tungsten-carbide tips frequently while in the machine to retain a sharp edge, claiming that this practice increases the number of pieces machined between grinds.

The lapping disk in the majority of cases was cast iron, but silicon carbide, bakelite, Swedish iron, wood, and both iron and steel with copper insets were also used. In 70 per cent of the answers the lapping disk was charged with diamond dust or the latter was used as lapping compound, but flour of emery, Carborundum, Crystollon powder, boron carbide, and tripoli were also mentioned.

All but one used oil for a vehicle with the lapping compound, and the majority reported it was olive oil. The one exception used water.

The amount removed by lapping averaged 0.0003 in., although the answers varied from 0.0001 to 0.005 in. One firm merely removed the tool marks. The time for lapping ran from ½ min. to 3 hr., but the majority required between 5 to 15 min. without regard to size.

The specifications of the hone used varied from 150 to 500 grain Crystollon or Carborundum stones. All but three would be included in a range between 180 and 300; four re-

**Table II—Typical Examples Showing Savings on Turret Lathes**

| Application No. | 5 | | 6 | | 7 | | 8 | |
|---|---|---|---|---|---|---|---|---|
| Material cut | Cast-steel alloy | | Cast bronze | | Vanadium iron | | Cast iron | |
| Specifications | C 0.35, Ni 2, Cr 0.75, Mo 0.25 | | C 80, Zn 3, Sn 11, Brinell 50 | | C 2.6, Si 3, Mn 0.47, Cr 0.032, V 0.092 | | Commercial gray iron 140-150 Brinell | |
| Cutting quality of material | Hard scale sand and holes, hard and tough, Brinell 250 | | Sand | | Sand and blow holes; very hard | | Hard | |
| Condition of machine tool | Good | | Good | | Good | | Good | |
| Size of tool, in. | 1¼×1¼×7 | | ⅝×⅝ | | ⅞×⅞×4 | | 1×1¼ | |
| Size of tip, in. | ⅝×⅝×1⅜ | | ⅛ thick | | (See Fig. 5) | | ¼×½×1 | |
| Shape of nose | Round | | Square | | Square | | Round | |
| Clearance angle, deg. | 5 | | 6 | | 6 | | 7 | |
| Top side rake, deg. | 4–8 | | 0 | | 0 | | 11 | |
| Top front rake, deg. | 12 | | 0 | | 12 | | 4 | |
| Operation | Turning and facing | | Turning | | Turning and facing | | Turning | |
| Tool material | T-C | Cob. H.S.S. | T-C | Cob. H.S.S. | T-C | Stellite | T-C | Stellite |
| Cutting speed, ft. per min.: | | | | | | | | |
| Roughing | 120–150 | 30–50 | 670 | 183 | 359 | 110 | 270 | 125 |
| Finishing | .. | .. | 670 | 183 | 65 | 55 | 340 | 125 |
| Feed, in. per revolution: | | | | | | | | |
| Roughing | 0.030 | 0.065 | Hand | Hand | 1/32 | 1/32 | 1/32 | 1/32 |
| Finishing | .. | .. | Hand | Hand | 0.028 | 0.028 | 0.020 | 1/32 |
| Depth of roughing cut, in. | ¼ ⅛ | ⅛ ⅜ | 7/32 | 7/32 | 7/32 | 7/32 | ¾ | ¾ |
| Cu. in. removed per minute | 12.6 | 10.25 | .. | .. | 26 | 14 | | |
| | Intermittent | | Continuous | | Continuous | | Continuous | |
| Number of pieces per grind | 12 | ½–2 | 6000 | 70 | 15 | 3 | 15 | 15 |
| Number of grinds per tool | .. | .. | 22 | 67 | .. | .. | 20 | 20 |
| Cost of tool | .. | .. | $1120 | $1.85 | $41.30 | $5.00 | $48.00 | $3.51 |
| Time per piece, min. | 60 | 75 | 2.603 | 3.614 | 1.07 | 2.00 | 26 | 50 |
| Savings in labor cost, per 100 pieces | $15.00 | | $1.76 | | $1.10 | | $24.00 | |
| Decrease in cost per 100 pieces | $55.00 | | .. | | .. | | $9.10 | |

**Table III—Typical Examples Showing Savings on Automatics**

| Application No. | 9 | | 10 | | 11 | |
|---|---|---|---|---|---|---|
| Material cut | Cast iron | | Steel | | Malleable iron | |
| Specifications | GMC 13M, 165-217 Brinell, normalized and cooled slowly | | S.A.E. 1020 | | C 2.5, Si 1.05, Mn 0.43, 114 Brinell | |
| Cutting quality | Hard scale | | Hard scale | | Good | |
| Condition of machine tool | Good | | Good | | Good | |
| Size of tool, in. | $\frac{5}{8}\times\frac{3}{4}$ | | $2\times2\times2\frac{1}{2}$ | | $1\frac{1}{2}\times1\frac{1}{2}\times3$ | |
| Size of tip, in. | $\frac{3}{4}\times\frac{5}{8}\times\frac{3}{4}$ | | $\frac{3}{4}\times\frac{3}{4}\times1$ | | .. | |
| Shape of nose | Round | | Forming tool | | Diamond point | |
| Clearance angle, deg. | 5 | | 12 | | 6 | |
| Top side rake, deg. | 6 | | 0 | | 3 | |
| Top front rake, deg. | 6 | | 0 | | 6 | |
| Operation | Turning | | Forming | | Turning | |
| Tool material | T-C | Stellite | T-C | H.S.S. | T-C | Stellite |
| Cutting speed, f.p.m. | 166 | 80 | 211 | 105 | 220 | 150 |
| Feed, in. per revolution | .. | .. | 0.002 | 0.002 | .. | .. |
| Depth of cut, in. | $\frac{5}{8}$ | $\frac{1}{8}$ | .. | .. | 0.03 | 0.03 |
| Number of pieces per grind | 1100 up | 200 | 27,000 | 7,200 | 1800 | 800 |
| Cost of tool | $12.85 | $3.75 | .. | .. | $15.00 | $1.15 |
| Time per piece, min. | 0.531 | 0.876 | .. | .. | 0.50 | 0.66 |
| Savings in labor cost, per 100 pieces | $0.34 | | | | $0.17 | |

ported using India oil stone, giving no other data.

To the question, "Do you find it possible to leave less metal on your work for finish because the hard metals can cut scale more readily?" 37 companies answered in the affirmative and 35 in the negative. Of the latter, several stated that they had no experience or had not attempted to change the amount of finish. As to protection from flying chips, 30 companies reported using goggles or glasses, 24 guards or screens and 15 reported having no protection and no difficulty. One company stated that, where tools are ground with a chip breaker, no protection is required.

Regarding difficulty in obtaining the desired finish with the hard cutting materials, 65 companies reported no difficulty, and three reported a better finish. However, 14 firms reported that they did have trouble, one company having difficulty in reaming operations only.

### Tool Angles Vary Considerably

The second part of the committee's questionnaire dealt with typical successful operations. The 37 companies that gave definite figures included 11 machine tool builders, six builders of other types of machinery, two electrical companies, two manufacturers of plumbing equipment, two makers of ball and roller bearings, two chain manufacturers and seven others, showing, in all, quite a diversification of products. Typical examples of savings on engine lathes, turret lathes, automatics, vertical boring mills, milling machines, drill presses, and horizontal boring machines, using tungsten-carbide tools, are given in the accompanying tables, which were compiled by the committee.

All tips were brazed and, in addition, 12 were dovetailed. The reports show that the clearance angle varied from 2 to 14 deg. The top front rake also varied considerably, 10 companies reporting 0 deg.; four, 4 deg.; eight, 6 deg.; and four companies, 12 deg. The others were scattered between 1 and 20 deg. The top side rake varied from 0 to 18 deg., but the average was approximately 6 deg. The radius at the point of the tool is evidently not important, as successful tools were ground with a radius from 1/32 to $\frac{3}{8}$ in., states the report. The most popular was 1/16 in.

The condition of the machine tools was good for 28 of the successful applications, fair for 10, but in one case it was poor. There were 24 applications on motor-driven machine tools and 17 on countershaft-driven machines. In motor drives the drive was through silent chain, V-belts, flat belts, gears and worm and wheel.

### Method of Mounting the Tools

A square turret type of tool holder was used in 16 cases and a plain tool post in seven cases. The remainder used boring bars, drill spindles, special tool holders, box tools, etc. All tools were clamped by setscrews, except that three had clamps, one a wedge and one used a bolt through the shank.

Comment by the committee on the tables reproduced herewith is in part as follows: Table I, engine lathes, the increases in cutting speeds and increases in number of tools per grind are extremely good. In Table II, turret lathes, application 8 is interesting in that no more pieces per grind were obtained than with stellite, but the difference in cutting speeds permitted a saving. In Table III, application No. 9 is interesting, as it shows the elimination of the finishing cut. The boring mill applications, Table IV, are nearly all on large jobs. The cutter used in application 20, Table V, milled on an average 20,000 pieces per grind, and there were 40 grinds in the life of the cutter. Data on drill press applications, Table VI, are few; one application is interesting in that 10,000 holes per grind were obtained. In the horizontal boring machine applications, Table VII, the cutting speed is not high, but the life of the tungsten carbide shows up better than the steel tools.

Favorable and unfavorable comments received with the replies to the

**Table IV—Typical Examples Showing Savings in Vertical Boring Mills**

| Application No. | 12 | | 13 | | 14 | | 15 | | 16 | | 17 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Material cut | C. I. | | C. I. | | C. I. | | C. I. | | C. I. | | C. I. | |
| Specifications | Semi-steel | | | | Si 1.58, Mn 0.76, S 0.075, P 0.26, 23 Rockwell | | 180-210 Brinell | | 20 Rockwell, annealed | | | |
| Cutting quality of material | Sand and hard scale | | | | Hard scale | | Hard scale, sand | | Hard scale, blowholes | | Hard scale, sand, blowholes | |
| Condition of machine tool | Fair | | Good | | Good | | Poor | | Good | | Fair | |
| Size of tool, in. | $1\frac{1}{4}\times1\frac{1}{4}$ | | $1\times1\frac{1}{4}\times8$ | | $1\frac{1}{2}\times1\frac{1}{2}\times8$ | | $1\frac{1}{2}\times1\frac{1}{2}\times9$ | | $1\times1\frac{1}{4}$ | | $1\frac{1}{4}\times1\frac{1}{4}$ | |
| Size of tip, in. | .. | | $\frac{3}{8}\times\frac{1}{8}\times1\frac{1}{8}$ | | $\frac{1}{2}\times\frac{1}{2}\times1\frac{1}{4}$ | | $\frac{1}{2}\times\frac{1}{2}\times1\frac{1}{2}$ | | $\frac{3}{8}\times\frac{1}{2}\times1$ | | $\frac{3}{8}\times\frac{3}{8}\times1\frac{1}{4}$ | |
| Shape of nose | Style 13 | | .. | | .. | | Round nose | | Round nose | | Style 13 | |
| Clearance angle, deg. | 4 | | 6 | | 4 | | 6 | | .. | | 6 | |
| Top front rake, deg. | 12 | | 12 | | 6 | | 12 | | .. | | 4 | |
| Top side rake, deg. | 0 | | 0 | | 8 | | 0 | | .. | | 12 | |
| Operation | Turning and facing | | Turning | | Turning and facing | | Turning and facing | | Turning and facing | | Turning and facing | |
| Tool material | T-C | Cob. H.S.S. | T-C | H.S.S. | T-C | H.S.S. | T-C | H.S.S. | T-C | H.S.S. | T-C | H.S.S. |
| Cutting speed, f.p.m.: | | | | | | | | | | | | |
| Roughing | 160 | 75 | 176 | 60 | 100 | 65 | 70 | 30 | 81 | 60 | 180 | 90 |
| Finishing | 240 | 90 | .. | .. | .. | .. | .. | .. | .. | .. | 230 | 110 |
| Feed, in. per revolution: | | | | | | | | | | | | |
| Roughing | $\frac{1}{16}$ | $\frac{1}{32}$ | 0.03 | 0.03 | 0.061 | 0.061 | $\frac{1}{32}$ | $\frac{1}{16}$ | 0.062 | 0.062 | 0.031 | 0.031 |
| Finishing | (1) | (1) | .. | .. | .. | .. | .. | .. | .. | .. | 0.010 | 0.010 |
| Depth of cut roughing, in. | $\frac{3}{8}$ | $\frac{3}{8}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | 0.625 | 0.625 | $\frac{1}{4}$–$\frac{3}{8}$ | $\frac{1}{4}$–$\frac{3}{8}$ | $\frac{3}{8}$ | $\frac{3}{8}$ | $\frac{5}{16}$ | $\frac{7}{16}$ |
| Cu. in. removed per min. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 12.5 | 6.3 |
| Number of pieces per grind | 2 | 1 | 100 | 8 | 3 | 1 | 1 | $1\frac{1}{2}$ | 20 | 3 | 600 | 30 |
| Cost of tool | $73 | $6 | $74 | $2 | $48 | $8.65 | .. | .. | $59 | $4 | $200 | $40 |
| Time per piece, min. | 90 | 210 | 96 | 116 | 240 | 360 | 114 | 240 | 162 | 225 | 11.3 | 17.4 |
| Savings in labor cost | | | 8.25 hr. per 25 pieces | | $2.80 per piece | | 22 per cent | | $73 per 100 pieces | | $24 per 100 pieces | |
| Decrease in net cost | $3.50 per 10 pieces | | $2.18 per 100 pieces | | | | | | $20.50 per 100 pieces | | 20 per cent | |

committee's questionnaire were included in the progress report. Among the favorable comments was the statement of a machine tool builder, who reported that the management is a strong believer in tungsten carbide and has been able to make remarkable savings. More than 30 milling cutters from 3 to 14 in. in diameter are in use in this shop.

Another company reports great success sawing insulating material with a tungsten-carbide-tipped saw. A tool manufacturer states that the application of tungsten carbide to saw teeth and knife edges is a proved fact. The same company has had success cutting steel files with tungsten-carbide-tipped chisels. The chisels are machine driven, making 900 to 1900 blows per min. and from 30 to 40 impressions per inch on the file. The hardness of the file is from 8 to 28, Rockwell C scale. The tungsten-carbide-tipped chisels cut from 40 to 60 dozen files before becoming dull, while the high-speed-steel chisels could only cut about 12.

A machine tool builder finds the angles of the tools have to be much greater than the tungsten-carbide manufacturers recommend. Quite often a 20-deg. hook in the tool is found. This concern finds 350 ft. per min. on cast iron the proper cutting speed, but the lathes used with this material must be kept in practically perfect shape, and the size of the driving belts has been doubled.

The same company finds the first cost of the tool relatively unimportant. It says that a $40 tool, used properly, will pay for itself in 20 hr.

Among the items of unfavorable comment, the report states that several companies think that the present price level is one of the most important factors in retarding the use of tungsten carbide.

One manufacturer stated he cannot take advantage of the material because the set-up time is so great compared to machining. He also feels that there is insufficient knowledge available as to feed, speed and depth of cut. He suggests that a series of experiments be conducted such as F. W. Taylor conducted with high-speed steel. Information now available is believed to be unreliable. He also claims that the material is being placed on the market with a minimum amount of information regarding its correct use and only in isolated cases are the results being obtained which are inherent in the material.

**Table V—Typical Examples Showing Savings on Milling Machines**

| Application No. | 18 | | 19 | | 20 | |
|---|---|---|---|---|---|---|
| Material cut | Cast iron | | Bakelite | | Rubber strips | |
| Specification | Brinell 210, hard scale | | Hard | | | |
| Cutting quality of material | Hard | | Abrasive | | Abrasive | |
| Condition of machine tool | New | | ... | | Good | |
| Size of cutter, in. | 13×2 | | 3½×½ | | 3¼×3 | |
| Number of teeth | 32 | | 18 | | 18 | |
| Size of tip, in. | ⅝×½×⅜ | | ... | | ⅝×¾×3/16 | |
| Clearance angle, deg | 7 | | ... | | ... | |
| Top side rake, deg | 5 | | ... | | ... | |
| Top front rake, deg | 5 | | ... | | ... | |
| Method of holding teeth | Wedge | | ... | | ... | |
| Tool material | T-C | Stellite | T-C | Stellite | T-C | H.S.S. |
| Cutting speed, f.p.m. | 120 | 75 | 2000 | 2000 | 600 | 600 |
| Feed, in. per min. | 18 | 12 | 252 | 252 | 85.8 | 85.8 |
| Depth of cut, in. | ⅛ | ⅛ | ⅛ | ⅛ | ... | ... |
| Cu. in. removed per min. | 7 | 4.4 | ... | ... | ... | ... |
| Number of pieces per grind | 250–350 | 75–100 | 160,413 | 14,583 | 20,000 | 200 |
| Number of grinds per tool | ... | ... | ... | ... | 40 | 20 |
| Cost of tool | $252 | $40 | ... | ... | | |
| Time per piece, min. | 7.97 | 12.73 | | | | |
| Savings in labor cost, per 100 pieces | $6.50 | | $0.0225 | | $0.03 | |
| Decrease in cost per 100 pieces, including tool cost | $2.50 | | | | $0.24 | |

Organized Research Recommended

This, of course, is well known by the sub-committee, and it is one of the objects of this second questionnaire to obtain some definite data that are authentic, said Mr. Sellers. The sub-committee has had in mind for two years the experiments suggested, but it is a large task and one that is difficult to get anyone to undertake or to finance. If all of those interested to this extent would be willing to contribute to a fund for such a purpose, the proposition could be put across, and this would be the best means of obtaining the desired information in the shortest time.

The members of the sub-committee have been reporting progress of the companies with which they are connected, and a number of interesting developments are under way. For instance, the Union Carbide & Carbon Research Laboratories, Inc., is conducting a series of experiments correlating red hardness and cutting quality, and Prof. O. W. Boston, University of Michigan, is making a series of tests with cobalt high-speed steel. The General Electric Co. has purchased for its Schenectady and Lynn plants special lathes to obtain accurate and conclusive data pertaining to the use of tungsten carbide and tantalum carbide as cutting media. These lathes are ten times more powerful than standard makes of the same nominal size, and will give an opportunity such as was never before afforded to learn the possibilities of these cutting materials. At the time this report was being prepared the G. E. company was negotiating with vertical-boring-mill makers with the same object in mind.

In conclusion, the committee points out that considerable has been learned about tungsten carbide in the past year and a half. There is a great deal more to be learned, and scientific data are needed most. It seems that machine-tool manufacturers have not made much progress, probably because of the lack of definite information as to how far they should go and along what lines they should proceed.

**Table VI—Typical Examples Showing Savings on Drill Presses**

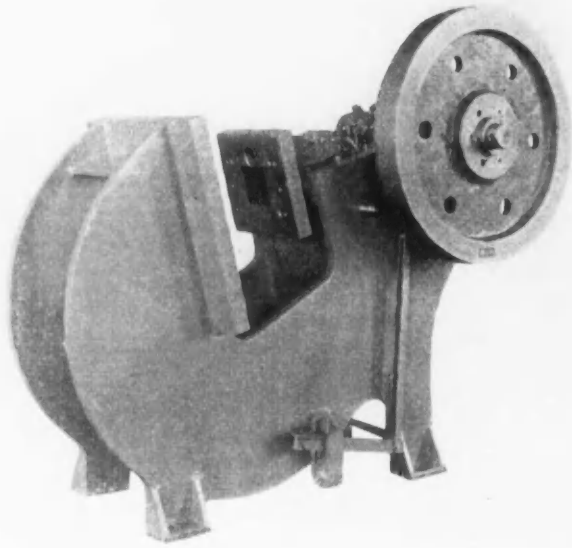
| Application No. | 21 | | 22 | |
|---|---|---|---|---|
| Material | Cast iron | | Cast iron | |
| Specification | Hard scale | | 200 Brinell, hard scale and sand | |
| Cutting quality of material | Hard | | Hard | |
| Condition of machine tool | Fair | | Fair | |
| Diameter of drill, in. | 1½ | | ⅞ and 1¼ | |
| Tool material | T.C. | H.S.S. | T-C | H.S.S. |
| Cutting speed, f.p.m. | 60 | 20 | 160 | 60 |
| Feed, in. per revolution | 0.006 | 0.006 | 0.011 | 0.011 |
| Number of holes per grind | 1000–1500 | 50–75 | 10,000 | 200 |
| Number of grinds per tool | 30 | 20 | .. | .. |
| Cost of tool | $60 | $15 | | |
| Savings in labor cost, per 100 pieces | $0.53 | | .. | .. |
| Decrease in net cost per 100 pieces, including cost of tool | $1.833 | | .. | .. |

**Table VII—Typical Examples Showing Savings on Horizontal Boring Mills**

| Application No. | 23 | | 24 | |
|---|---|---|---|---|
| Material | Cast iron | | Cast steel | |
| Specifications | 196 Brinell | | 0.40–0.50 carbon sand and blow-holes | |
| Cutting quality of material | Good | | Soft, stringy, and abrasive | |
| Condition of machine tool | Good | | Fair | |
| Size of tip, in. | ¾×¼×⅞ | | | |
| Clearance angle, deg | .. | | 4 | |
| Top side rake, deg | .. | | 4 | |
| Top front rake, deg | .. | | 6 to 8 | |
| Operation | Boring | | Boring | |
| Tool material | T. C. | Cob. H.S.S. | T. C. | H.S.S. |
| Cutting speed, f.p.m.: | | | | |
| Roughing | 20–36 | 18 | 85–100 | 40–50 |
| Finishing | .. | .. | 40–50 | 30 |
| Feed, in. per revolution: | | | | |
| Roughing | 1/16–3/32 | 1/16–3/32 | 0.053 | 0.056 |
| Finishing | .. | .. | 0.40 | 0.29 |
| Depth of cut, in. | ⅛ | ⅛ | 0.250 | 0.187 |
| Number of pieces per grind | 8 | 1 or 2 | 10–15 | 1 |
| Number of tools used | 3 | 3 | .. | |
| Cost of tool | $45 | .. | $48 | $14 |
| Time per piece, hr. | 16 | 28 | 0.30 | 0.60 |
| Savings in labor cost | $8.64 per piece | | $18 per 100 pieces | |
| Decrease in cost of work, including tool cost | After 5 pieces, 43% | | $65 per 100 pieces | |

# Henry & Wright Enlarges Welded Steel Press Line

EXTENSIVE additions have been made to the line of steel presses of welded construction in the inclinable and single-crank straight-sided types introduced several months ago by the Henry & Wright Mfg. Co., Hartford, Conn., and announced in THE IRON AGE of April 30. These include a series of double-crank, straight-sided presses, horning types, straight-sided knuckle-joint presses, double-crank overhanging cap frame presses, as well as various special types.

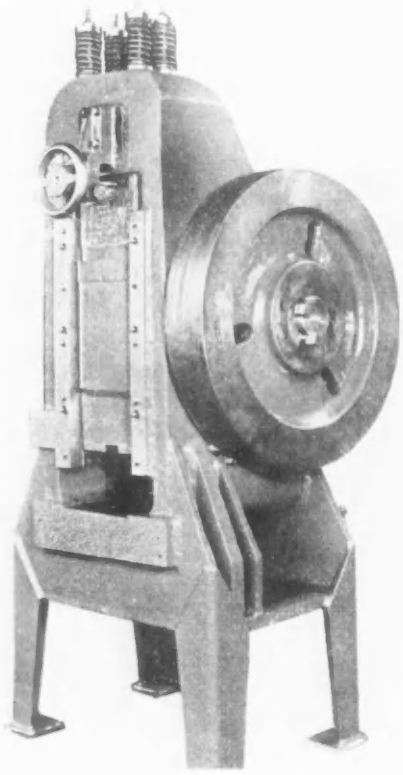


WELDED steel press inclined at 15 deg. from the horizontal for special requirements.

### Frames Annealed and Normalized

Practically all of the single-crank, double-crank and knuckle-joint presses are of shrunk-in tie rod construction, although some have been built with solid frames where special tooling or other conditions warranted. In either type of construction, the frame members, as well as the slide and large gears, are made from welded steel annealed and normalized before machining in order to release any stresses set up in either the rolling or welding processes and to eliminate the possibility of distortion after the machines have been placed in operation. The welded units are made from steel plates of special welding quality and are arc-welded with high-grade covered wire, particular attention being given to heat control.

Low unit stress values are used throughout the entire series of presses to eliminate any possible set or deflection in the frames even if large overloads should be accidentally applied.



SOLID frame type, 200-ton knuckle-joint press (above). Welded construction includes slide and wedge block as well as frame.

The welded steel frame shown at right will replace the cast-iron frame of a horning press which had broken around the horn handle.

### Solid Frame Knuckle-Joint Press

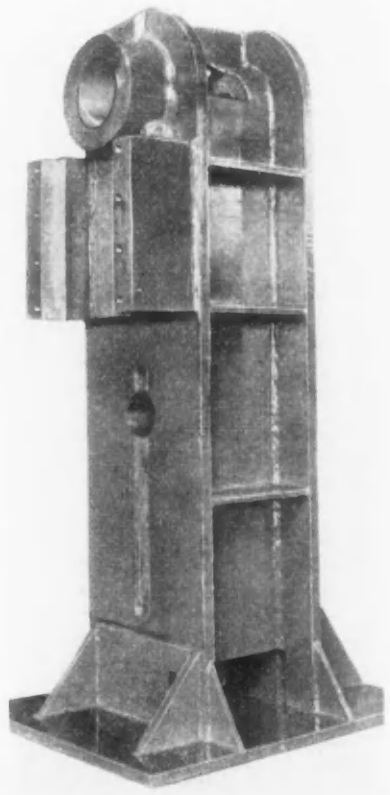
The 200-ton capacity knuckle-joint press illustrated is of solid frame type in order to keep the right to left overall dimension to a minimum for the required die space. In addition to the frame, the slide and wedge block are also made from fabricated steel units to obtain the required rigidity for the especially intricate coining operation which the presses were designed to perform. The design of the slide and link mechanism is such that a length of guideway on the slide approximately 50 per cent longer than is customary on a press of this capacity is obtained without increasing the overall height of the press.

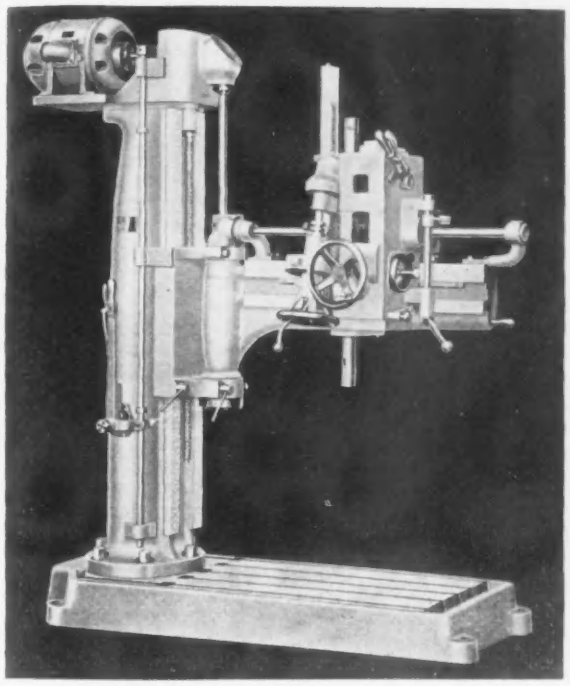
This machine has a ½-in. stroke and operates at 65 strokes a min. Slide adjustment of ½ in. is provided by a wedge. Continuous force feed lubrication is applied to the hardened and ground alloy-steel pins and link linings from a pump and oil reservoir located at the rear of the press. Finished pads are furnished on the frame so that the user can mount special feeds previously used on cast iron frame presses for this work.

Another welded steel press, built for special tool requirements, is the fixed inclined open back type shown at the top of this page. This machine is inclined 15 deg. from the horizontal and has a large bed area and opening for its capacity. Although it is lighter in weight than a cast iron press of corresponding crankshaft diameter, an increase of over 30 per cent in die life is reported as being obtained on the battery of presses of this type.

### Welded Frames for Replacements

The company is also furnishing welded steel frames of all types to replace broken cast-iron press frames. The steel frame illustrated was built to replace the cast-iron frame of a 55-ton horning press which had broken around the horn hole. The steel frames are machined to use the shaft, slide and all other parts of the old presses.





FEATURING the company's "low hung" drive, this radial has a maximum cutting spindle speed of 2000 r.p.m.

# High-Speed Radial Machine for Drilling and Tapping

THE radial drilling and tapping machine here illustrated has been designed by the Western Machine Tool Works, Holland, Mich., for high-speed operation on small diameter holes. It is ball bearing equipped throughout, there being 14 ball bearings on the main drive alone. The company's "low hung" drive is employed and operation of the cutting spindle at speeds up to a maximum of 2000 r.p.m. is possible. The machine is of the all-geared positive drive type; there are six geared feeds, from 0.003 to 0.017 in., and six geared speeds, from 300 to 2000 r.p.m., in the head. All gears are of chrome-nickel steel, heat treated and hardened.

Speed reduction from the drive shaft to the feed mechanism is obtained by a steel worm engaging a bronze wormgear. The feeds can be disengaged by hand or by an automatic depth gage which can be set to trip at any desired point. A small handwheel at the right of the head furnishes means for hand feeding.

Power is transmitted to the spindle through twin disk clutches which operate at a constant speed. Clutch control is by means of a ball lever handle which starts, stops and reverses the spindle. This, and all other operating controls, are located in a convenient position for the operator.

The arm is of double-wall section; its entire weight is supported on a large ball-thrust bearing at the bottom of the lower trunnion. The upper trunnion has a large roller bearing designed to permit the arm to swing easily. The elevating mechanism is completely inclosed and runs in oil. It is disengaged at both extreme ends of the saddle traverse by means of automatic knockoffs. Power is supplied by one constant-speed 1200-r.p.m., 3-hp. electric motor.

Six sizes are offered ranging from 3 to 6 ft. Traverse of head on arm is $27\frac{1}{2}$ in. on the smaller size and $57\frac{1}{2}$ in. on the largest. Traverse of saddle on column is $38\frac{1}{2}$ in. and the spindle has a 12-in. traverse on all sizes. Floor space required for the smallest size is $27\frac{1}{2}$ x 68 in.; for the largest, $27\frac{1}{2}$ x 104 in.; net weights without motor are 3325 and 4375 lb.

## Small Flexible Couplings

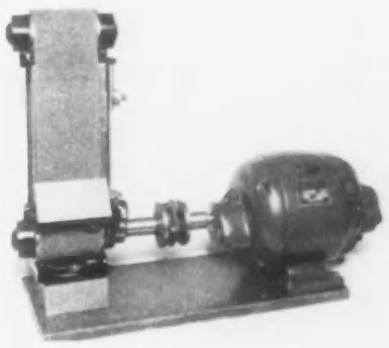
TWO new flexible shaft couplings brought out by the American Flexible Coupling Co., Erie, Pa., and designated as the Nos. 4 and 6, have maximum bores of ¾ and 1 in. In general design and operation they are the same as the larger couplings made by this company. Power capacities are 0.05 and 0.15 hp. at 100 r.p.m.; both sizes of the small couplings permit a maximum of 1/64 in. parallel and 1 deg. angular misalinement.

The flange sections are die-cast and have two jaws between which the floating center member—a solid, non-metallic, self-lubricating piece—slides. This central block transmits the torque and is said to permit the comparatively large misalinement with small power loss. It is not necessary to dismantle the coupling to disconnect the driving and driven shafts. Standard flanges are provided with a single setscrew, but additional setscrews or keyways can be provided. The units weigh ¾ and 2 lb. respectively.

## Offers New Abrasive Belt Grinder

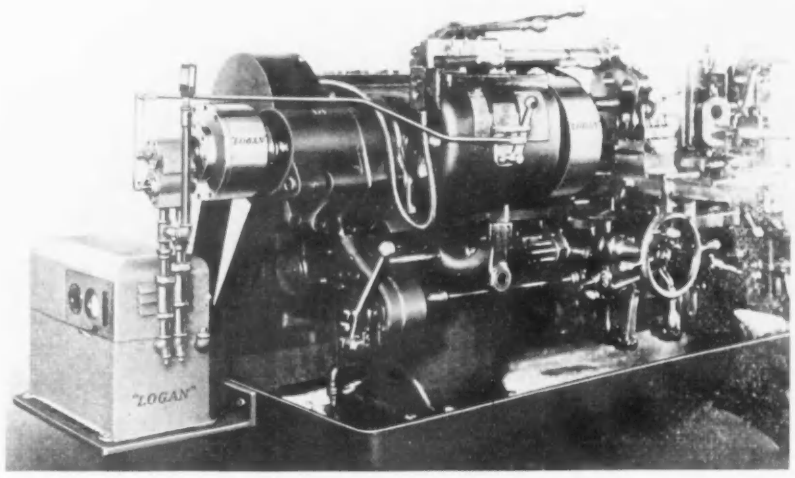
ABRASIVE belt grinding machines marketed by the Coats Machine Tool Co., 110 West Fortieth Street, New York, may be operated in either the horizontal or the vertical position. The base is machined at right angles and a tilting table is provided for the vertical mounting. Drive is by direct-connected electric motor as illustrated, or by flat belt with tight and loose pulley and belt shifter.

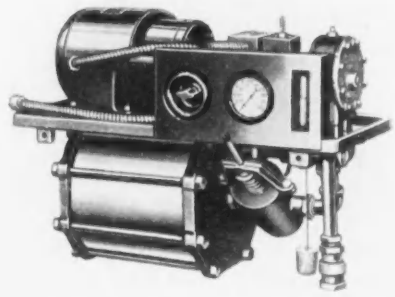
Ball bearings with dust-proof and grease-packed housings are employed throughout. The center-to-center distance of the belt drum can be adjusted to take up belt stretch. Another important adjustment is the track regulating device which permits the upper drum to be tilted from the horizontal in order to compensate for unequal belt lengths measured at opposite sides of the belt. This adjustment, which is designed to prevent the belt from wobbling or running off the track, is actuated by means of a micrometer screw with locknut. It is said to permit the operator to run the belt at the extreme edge of the table if desired.



The abrasive belt can be used in the horizontal as well as vertical position.

The grinders are offered in seven sizes having grinding tables ranging from 4 x 11¾ in. to 7⅞ x 33¾ in., the two largest sizes being available for horizontal operation only. A detachable extension table is obtainable for use in grinding flat internal surfaces.



IN the close-up view of power unit, above, the case has been removed to show the hydraulic mechanism.

# Power Unit for Hydraulic Chucking Equipment

HYDRAULIC equipment, comprising a constant-delivery, variable-pressure type power unit with accumulator, has been placed on the market by the Logansport Machine Co., Logansport, Ind., for operating chucks, work holding fixtures, clamps, hoists, etc. The illustration shows this equipment mounted on a Warner & Swasey turret lathe in connection with a Logan 15-in., three-jaw universal steel-body chuck.

Pressures within a range of 50 to 200 lb. are obtainable, adjustment being made by means of a regulating valve. The accumulator is of the spring type and acts as a pressure reserve for the unit. Accumulator pressure is from 225 to 275, always above the maximum pressure taken out through the regulating valve. When maximum pressure is built up in the accumulator the motor cuts out automatically and is started again by reduction of the pressure to the minimum of 225 lb. No by-passing of oil is required by this method of pressure control.

A panel board carries the motor switch, pressure gage and oil level gage as shown in the detail view of the power unit with case removed to expose the accumulator, pressure regulator, motor, pump and switches. The hydraulic control valve is an integral part of the cylinder; this feature is designed to minimize the amount of piping required from power unit to cylinder. The operation time of the equipment is reported as 1½ sec.; constant pressure is maintained on the work at all times, thereby keeping full gripping pressure during the machining operation.

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## Automatic Oiling System Has No Moving Parts

AN automatic oiling system for industrial machinery and automobile chassis, which operates electrically without pump or other moving parts, has been developed by Motor & Plane Accessories, Inc., Detroit. It consists of an oil tank made by the Westinghouse Electric & Mfg. Co., East Pittsburgh, which is equipped with a heater unit that is separated from direct contact with the oil. When the machine that is to be lubricated is started, the electric heater unit inside the tank is automatically turned on. This raises the temperature of the oil, causing expansion and forcing oil out of the tank to the bearings, where suitable metering devices control the flow of oil. After the temperature has reached 150 deg., a thermostat breaks contact and allows the oil to cool to 100 deg. At that temperature the thermostatic switch again makes contact.

During the cooling process a vacuum occurs which is utilized to refill the tank from a central supply or reservoir. To prevent drawing of oil back from the bearings, a check valve is used in the main feed line. To maintain the pressure on the main line while the tank is refilling, an auxiliary feeder is installed which continues to hold the pressure while the tank is being replenished. At no time during the operation is there a lack of pressure in the feed line.

In automobile chassis lubrication, a very small tank is installed in the channel of the frame, and new oil is taken either from the central tank or from a built-in tank in the filler spout of the motor. Every time oil is put into the engine it automatically refills the tank on the filler spout, thus assuring at all times clean oil for the system.

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ELECTRIC heating unit expands oil, forcing it from cylinder to bearings.

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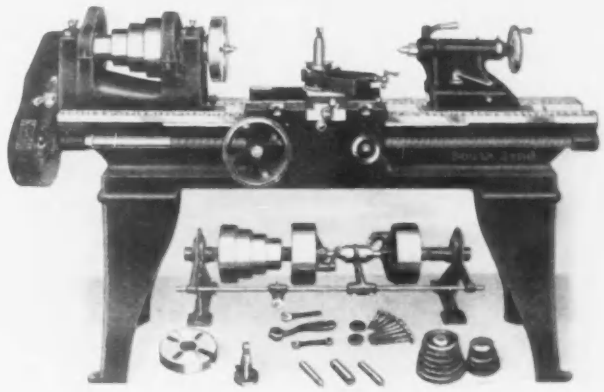
## New Welding Torch Lighter

A FLINT sparking lighter of substantial construction for lighting gas welding and cutting torches or for other industrial uses where gas has to be ignited has been placed on the market by the Modern Engineering Co., 3411 Pine Boulevard, St. Louis. Designated as the "Tripl-Flint" lighter, the device is provided with a replaceable metal holder carrying three small flints; adjustment is provided so that when one flint wears the next can be brought into contact with the cylindrical steel.

# Lathes with 16-in. Swing for General Service Work



A SIMPLIFIED lathe that provides for most light manufacturing operations.

GENERAL-PURPOSE 16-in. lathes for light manufacturing, general shop and maintenance work have been placed on the market by the South Bend Lathe Works, South Bend, Ind. Designated as the 16-In. Junior, the machines are available in bed lengths of from 6 to 12 ft. Construction is simplified, omitting features not needed in general machine shop work.

The lathe is a back-geared, screw cutting unit with automatic longitudinal feed and eight changes of spindle speed. All standard screw threads may be cut, from 2 to 40 per in., right or left-hand, including 11½ pipe thread. The headstock spindle is made of special carbon steel, finish ground, with a 1⅜-in. hole through its entire length. The tailstock has a set-over for taper turning, graduated spindle, improved binding plugs and hardened center. The compound rest will swivel to any angle and has an angular travel of 3¾ in. Bearings are of phosphor bronze, adjustable for wear.

Countershaft drive or various types of motor drive is offered. Safety, economy and convenience of operation are features emphasized.

## Alligator Switch Adapts Conveyors to Continuous Furnace

HANDLING packs between continuous furnaces and the mills by means of an alligator switch is an adaptation made by Logan Co., Louisville, Ky. The alligator switch automatically receives packs from either side of the continuous furnace and delivers them to the mill. It fills the gap between furnace and mill, making obvious savings in time and labor.

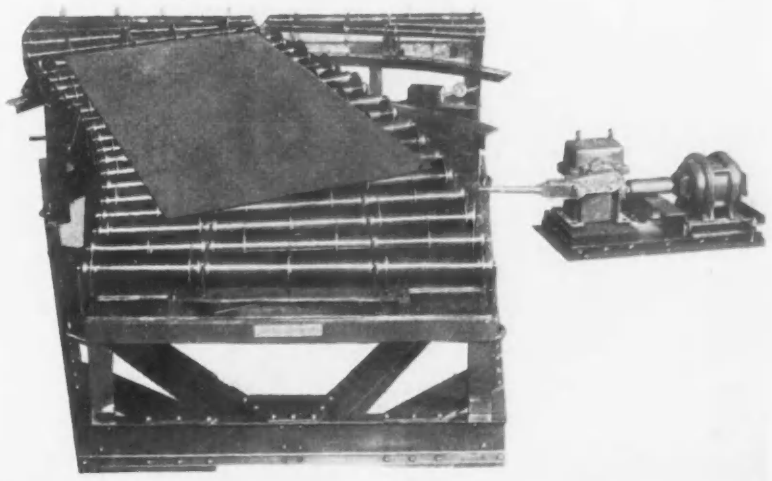
Although constructed throughout of rigid steel and void of any spring action, this device is as flexible as an alligator's tail. From this characteristic it derives its name. Each roll in the tail portion of the switch is mounted separately. By means of an ingenious lattice-work, each roll is always radial and in proper alinement with the others. Consequently the packs are guided accurately over any reasonable angle turn, and are delivered straight and true to the mill.

It is said to be the only switch section obtainable in which all the rolls automatically adjust themselves radially as the switch is moved from one side to the other. The movable parts of the alligator switch are operated by means of a motor through a speed reducer, and a crankshaft and lever, or in some cases through a reversible screw attachment.

Furnace and switch are electrically interlocked so that, when the mill operator presses a button for the last pass of the previous pack through the rolls, the next pack starts over the switch. It is said to work quickly, accurately and efficiently, to meet every pack as it comes from either side of the furnace, and to deliver it to the mill without damage or loss of time.

Frequently the first few rolls next to the furnace, which are stationary, are driven from a separate small motor, to help the discharge from the furnace.

All the rollers in this conveyor have 6-in. diameter steel disks welded to the roller proper at regular intervals, to prevent the heat from the packs coming out of the furnace, being conducted through the tubing of the rollers into the ball bearings. These disks radiate practically all the heat which they absorb from the packs before it has a chance to be conducted into the roller. The disks further help to keep the packs straight and, as there is so little surface in contact with the hot packs, there is no danger of damaging them while they are being conveyed.



## New Method of Attaching Tantalum-Carbide Tips

AN insert of pure molybdenum is employed in a new method of applying carbide tips to cutting tools developed by the Ramet Corpn. of America, North Chicago, Ill., and now being used in many of the tantalum-carbide tools manufactured by this company and its licensees. The insert is brazed between the steel shank and the carbide tip.

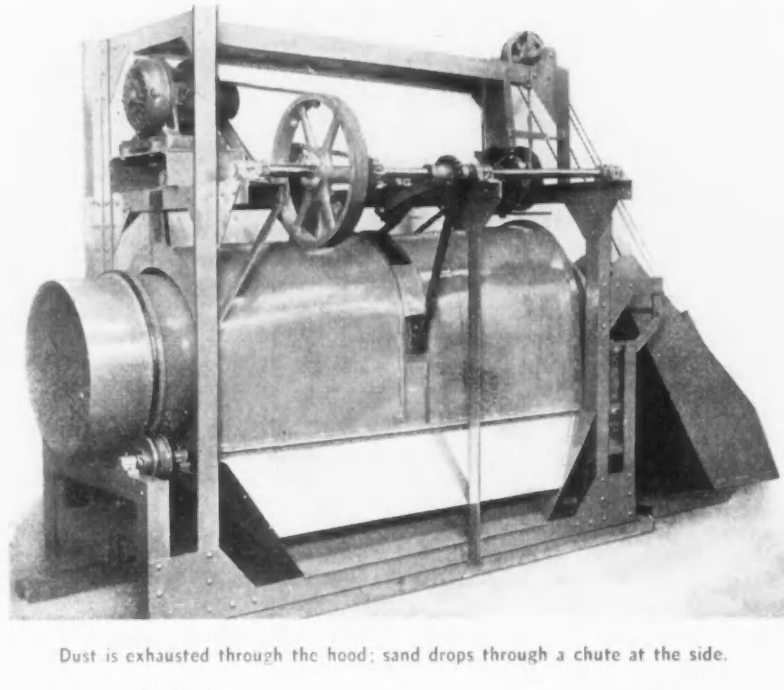
As molybdenum has almost the same coefficient of expansion as the tantalum-carbide alloy known as Ramet, the inserts are said effectively to prevent strains from being set up or cracks developing in the cutting tips while the tools cool after the brazing operation. Such strains as may develop between the molybdenum insert and the steel shank are entirely absorbed by the insert, due to its great ductility.

The new method is described as being especially desirable for tools having long, thin or unusually shaped tips, or where unusually severe operating conditions are expected. For small tools, the tantalum-carbide tip is now often mounted on a shank of solid molybdenum.

## Equipment for Shaking Out Annealed Castings

A NEW method for shaking out annealed castings, adopted by one of the larger malleable iron foundries in the Middle West, is said to result in cleaner castings and reduced tumbling time.

The annealing pots are dumped into a power-operated loading skip which charges a sand-shaking barrel, operating at 50 r.p.m. A hood and exhaust system removes dust; the heavy sand falls to the bottom of the hood and is delivered at the side of the machine. Castings are discharged from the end of the barrel into shop receptacles or into the loading skip of the barrel which is to perform the tumbling operation. This sand shaking barrel, manufactured by N. Ransohoff, Inc., Cincinnati, Ohio, is designed to prevent excessive sand from being carried into the tumbling barrels and thus to save time in the tumbling operation.



Dust is exhausted through the hood; sand drops through a chute at the side.

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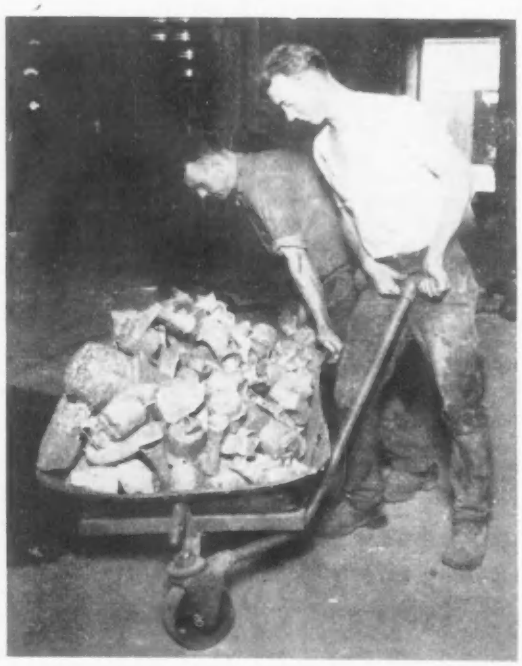
## Combination Transfer and Storage Truck

AN improved Jak-Tung truck for industrial and warehouse use is being made by Howe Chain Co., Muskegon, Mich. This truck is designed so that it is adapted for use as a hand truck or a trailer and for the temporary storage of materials. The body is of hardwood or steel. It is permanently attached to two rear wheels, with a malleable iron leg supporting the front. This represents the storage unit, immovable, self-contained and occupying little more space than the materials carried.

For use as a hand truck a jack-tongue is inserted in the drawbar and a simple downward movement of the handle exerts a cam action and elevates the front leg 1¼ in. from the floor. The improved roller bearing wheels make the moving of the trucks or trailer trucks a simple matter.

To couple the trucks in a tractor train, the truck is brought into position, the jack-tongue is removed, a trailer hitch is inserted in its place and coupled to the clevis of the preceding truck. The three-wheel construction assures accurate parking and permits short turns and negotiation of narrow pathways. Tractor trains of as many as 33 trucks have been found practical.

Use of the small light-in-weight jack-tongue makes unnecessary the use of wide aisles for storage purposes, as no space accommodation is needed to bring it into action. Only sufficient space is required to move the truck body in and out of position.



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JAK-TUNG truck handling scrap metal. Downward movement of the handle elevates the front leg from the floor to permit wheeling.

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## Offers Molybdenum Steel Hacksaws

MOLYBDENUM steel is used in a new line of hand and power hacksaw blades brought out by the

Victor Saw Works, Inc., Middletown, N. Y. The company, which this year is celebrating its twenty-fifth anniversary, has spent several years in developing the alloy steel used in the new blades and in the method of heat-treating them. Ability to withstand heavy duty service and economy are claimed for the new saws, which are finished in gold color for easy identification.

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Factory sales of wire nails and spikes in Canada in 1930 had a total value of $3,327,002, compared with sales in 1929 of $3,803,089, according to annual bulletin of the Dominion Bureau of Statistics, Ottawa. Steel wire sales in 1930, valued at $4,317,911, compared with $5,693,096 in 1929. Income from sales of iron and steel wire rope and cable in 1930 was $2,542,761, as against $2,912,020 in 1929. Wire fencing sales last year amounted to $2,457,446, compared with $2,855,427 the year before. Sales from the wire and wire goods industry in 1930 totaled $18,200,058, or 13 per cent under the record value of $21,647,273 in 1929.

## Making the Tube Control the Furnace

WHEN the temperature in a high-temperature furnace rises to the desired limit, an electric eye, or photoelectric tube, may operate a Thyratron tube to cut off the current or fuel supply. It has been difficult to read the high temperatures required in special furnaces used for industrial and laboratory purposes, and it has been exceedingly difficult to control these furnaces or maintain a set temperature.

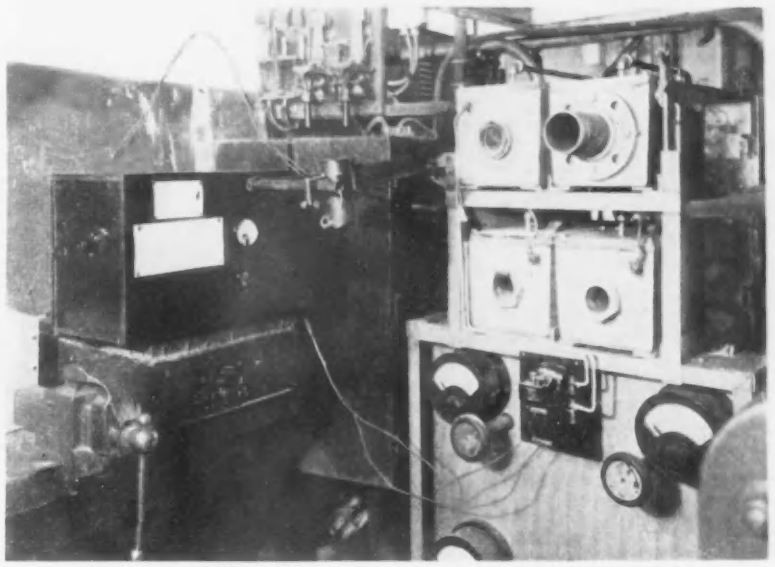
Dr. L. R. Koller, of the General Electric research laboratory at Schenectady, recently announced a solution for the problem, through using the photoelectric tube to measure the visible energy radiated by the hot body, and thereby its temperature. This tube, with a suitable optical system, looks at the furnace wall or some object in the furnace. The current through the tube depends on the amount of light falling upon it, and accordingly varies with the brightness of the surface observed.

Since the radiation from a hot body varies much faster than its temperature, the photoelectric current is a very sensitive measure of temperature. This current is amplified by means of vacuum tubes and recorded on a meter calibrated in terms of temperature. The same current operates a Thyratron tube, which acts as an extremely sensitive relay to control the supply of fuel or electricity.

This instrument can be used at temperatures as low as 1000 deg. C., and has no upper limit. It does not deteriorate from the action of any products in the furnace, for no part of the apparatus itself is in the furnace. It is said to be instantaneous in its action, very sturdy, and with no delicate moving parts. A single pyrometer reading supplies the calibration necessary from time to time. The control mechanism may be varied to suit individual needs; by the use of two Thyratrons, both upper and lower limits of temperature may be set.

The apparatus includes a long photoelectric tube housing, mounted on a hinged bracket which the operator can swing to one side when he has to get at the furnace. As much as three or four feet may separate the tube from the furnace proper. The bracket has a worm gear for ease in making adjustments. A small opening in the housing makes it possible to observe a light spot and make sure that it is centered on the diaphragm placed in front of the tube.

Recent improvements in the photoelectric and amplifier tubes, and the development of the Thyratron tube, have made it possible to convert the pyrometer in this instance into an automatic device, the chief advantage of which is to control as well as to measure the high furnace temperatures.



PHOTOELECTRIC and Thyratron tubes for controlling temperatures in high-temperature furnaces adjust the fuel supply as required.

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## Sanitary Lining for Steel Barrels

A NEW process for lining steel barrels with a protective sanitary coating, giving the interior a hard enamel-like surface and making the barrels suitable for handling various foods and other products that cannot be shipped in ordinary unlined steel barrels, has been developed by the National Steel Barrel Co., Cleveland. Manufacture of these lined barrels on a commercial basis has been commenced. This development is expected to cause considerable broadening of the field for steel barrels. The lining has been given the trade name "Protectoline."

As the coating is neutral and impervious it cannot, it is stated, affect the taste, odor or composition of products shipped in barrels lined with the material; contamination from contact with steel is avoided. The composition of the material used for the lining varies, depending on the kind of products to be handled. Research work is being conducted to determine the proper ingredients for coatings for barrels for various specific purposes.

Material used for the lining, in liquid form, is sprayed on the interior of the barrel and inside the heads before the three members are assembled. Then the barrel is placed on the conveyor of a continuous baking oven, in which the coating is baked at a temperature of about 350 to 500 deg. F., the work being kept in the oven 40 to 50 minutes. Usually only one application of the coating is required.

One type of coating being applied under this process has rubber as an ingredient. After this is applied the solvent is baked out in the baking operation, leaving a hard, thin coating of rubber on the surface of the steel.

Barrels so equipped may, it is stated, be used as containers for shipping edible oils, fruit juices, milk products, tomato products and other food products, as well as some other items such as medicinal and other oils. Many of the products that may be shipped in the lined steel barrels are now handled in wood, glass-lined, tin and galvanized containers.

## Telephone Sets for Use Out of Doors

A NEW outdoor telephone is offered by the Kellog Switchboard & Supply Co., Chicago, for use by railroads, mines and other industries where equipment is subjected to severe weather conditions. Weatherproofing is provided by a cast iron housing which is ventilated to prevent condensation of moisture or sweating. Iron and steel parts are protected by special moisture-proof finishes; all wires are rubber insulated and the coils are treated to resist moisture. Any circuit arrangement necessary to secure high quality transmission and reception and efficient ringing can be provided. Three dry batteries can be placed in the housing on a cast-in shelf; sliding shelves of Bakelite hold the company's standard five-bar or six-bar generator and the induction coil. The transmitter is of the low resistance local battery type; a watch-case type receiver is provided.

# Controls Atmosphere in Electric Heat-Treating Furnace

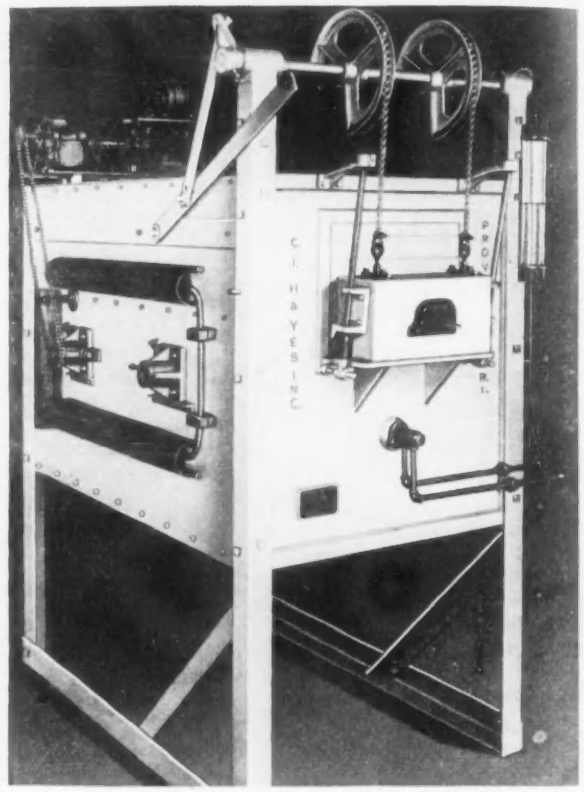
AN electrically-heated conveyor furnace equipped with the "Certain Curtain" atmosphere control, is a new product of C. I. Hayes, Inc., Providence, R. I. This furnace is designed expressly for production hardening of small tools or parts made of carbon or alloy steels. It is claimed to provide complete control of the atmosphere within the heating chamber, thus preventing scale, decarburization and other effects of uncontrolled or incompletely controlled furnace atmosphere.

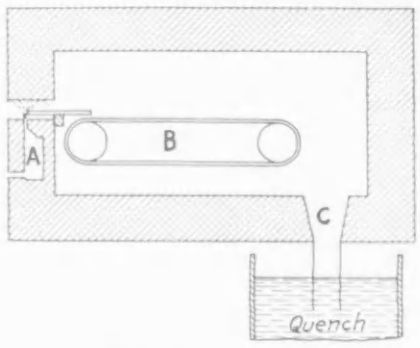
The simplified line diagram, Fig. 1, shows how complete control of atmosphere is accomplished. The furnace is sealed at the delivery end by means of a chute which extends below the surface of the quench. It is sealed at the entrance by the standard certain curtain atmosphere control system. This consists of a separate atmosphere combustion chamber in which a mixture of gas and air is burned to form the proper protective atmosphere with which to surround the steel. This protective atmosphere pours from a slot across the entrance and fills the furnace chamber and chute, while the pressure of it is such that it forms a "Certain Curtain" across the furnace mouth through which no outside air can enter.

Fig. 2 shows the general details of the furnace. On the left side is the apparatus for driving the conveyor belt at a range of speeds, while at the upper right appears the manometer indicators which permit accurate control over the gas and air admitted to the atmosphere combustion chamber. This manometer provides a record of the correct mixture for each operation and thus makes it possible to duplicate any atmosphere by simply duplicating the readings. The electric heating elements are sinuous windings of heavy cross section nickel-chromium ribbon. The operating temperature is up to 1650 deg. F.

FIG. 1.—(Below) The furnace is sealed at the entrance at A by the special atmosphere control system. It is also sealed at the delivery end C.

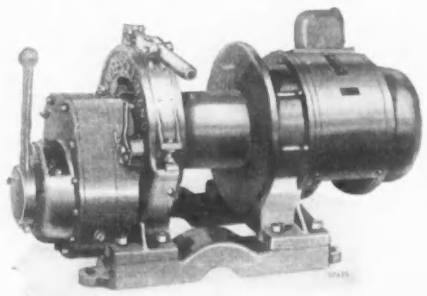
FIG. 2.—(At Right) General details of the furnace. Apparatus for driving the conveyor belt is shown at the left. The manometer indicators at the upper right permit accurate control over the gas and air admitted to the combustion chamber.




## Portable Electric Hoist for Single Cable Work

A NON-REVERSIBLE, single-drum electric hoist brought out by the Ingersoll-Rand Co., 11 Broadway, New York, for single cable work in the mining, contracting, and industrial fields is modeled after the company's "Utility" hoist, except that it has an electric motor and friction clutch instead of an air motor and a jaw clutch.



The new hoist is made in two sizes. No. 107, 7½ hp. and rated at 2000 lb. pull at 125 ft. a min., has drum capacity for 400 ft. of ½-in. or 700 ft. of ⅜-in. cable. No. 107L is of like power, but has drum capacity for 800 ft. of ½-in. or 1400 ft. of ⅜-in. cable. No. 110 has a 10-hp. motor and is rated at 2000 lb. pull at 165 ft. a min. The drum capacity is the same as for the No. 107. No. 110L has the same power as the No. 110 and the same drum capacity as the No. 107L.

Features include smooth control, graduation of speed, a self-energizing brake for stopping and holding the load, and an automatic safety drum lock for added safety when handling suspended loads. Either a.c. or d.c. motors can be furnished.

## Wright Model 30 Screw Hoist

A NEW hoist, model 30, being made by Wright Mfg. Co., Bridgeport, Conn., is said to be light and compact and particularly efficient. It is recommended for general repair work where it must be continually carried about and operated in different places. It is adaptable for work on the horizontal, such as moving heavy loads on rollers or skids.

Model 30 hoist is designed on the worm-wheel principle and is of few parts. It is claimed to be of extremely simple construction and to hold the load securely at any point.

It has special analysis steel load chains, electrically welded, heat treated and proof tested, and heat-treated, drop-forged hooks. Load-chain guards shroud the complete upper half of the load wheel, and prevent the load chain from riding out of the load-wheel pockets. A non-fouling hand-chain guide is fitted.

John Deere Tractor Co., Waterloo, Iowa, has recalled about 1000 employees on a two-days-a-week schedule. The plan is intended to give the greatest number of deserving employees such work as the company can provide.

# Larger Steel Output Does Not Mark a Turn

By DR. LEWIS H. HANEY
Director, New York University Bureau of Business Research

STATISTICALLY, the most striking fact in the unusual decline in the Steel Corporation unfilled orders in November is that it was sharper than that in October, the *rate* of change thus being downward. This almost always indicates a decrease in new business, since it suggests a decline too great to be caused entirely by increased shipments. Our adjusted index is down to 69.2 per cent of the average for 1923-1927, which compares with 76.1 at the end of October and 85.9 a year ago.

Almost equally unusual was the November increase in ingot production, a decrease of over 4 per cent being normal. The adjusted index rose to 41.1 per cent of estimated normal, against 36.7 in October. This compares with 33.1 at 1921 low.

This does not appear to mark a "turn" in the industry, since it does not reflect an increased volume of new business, but was at the expense of backlogs. Moreover, the increase was confined to Bessemer steel, relatively small in the total.

Output of pig iron in November reached a new low level for the recession. As adjusted for seasonal variation and long-time trend, the index becomes 38.2 per cent of normal, against 39.4 in October, and 65 a year ago. This is the lowest since September, 1921. July 1921, was 31.4.

This leaves steel production relatively high, in comparison with pig iron production, for the first time since last March. Under other circumstances it might mark the turning point in the recession. It is not usual, however, for steel production to lead pig iron production in recoveries in the business cycle. It usually rises more rapidly when a major turn occurs, but at the same time as pig iron.

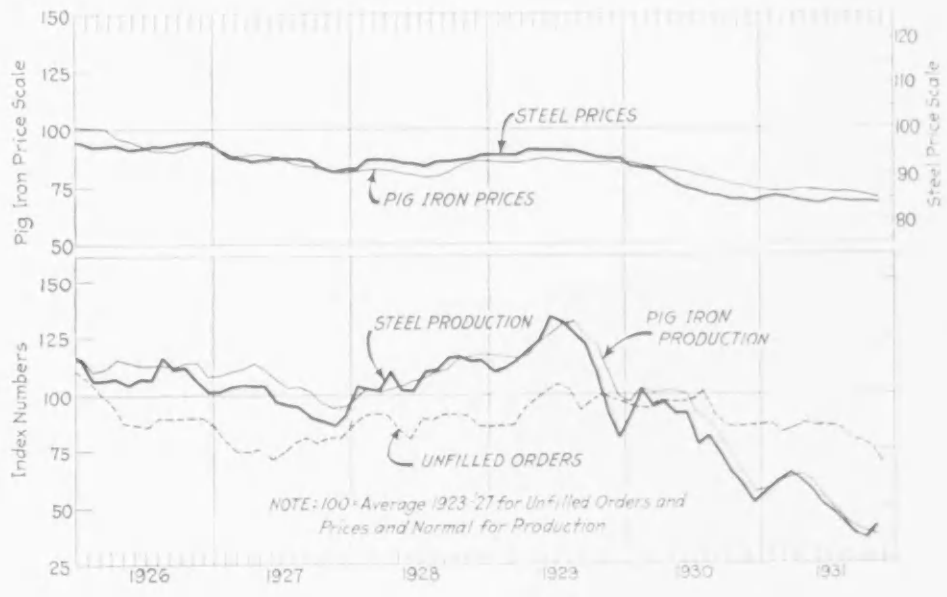
Finished steel in November, at 2.113c., makes the lowest average price since May, 1922, but compares with 2.007c. in February, 1922. The November average for pig iron was a new low monthly figure. Taking the average prices during 1923-1927 as a base, it was 69.9, which compares with a steel price index of 83.7. The continued sagging tendency of iron and steel prices, in view of the small amount of buying, suggests absence of market strength.

Looked at from a cold, statistical point of view, the probability seems to be that further price reductions may develop. A sharp decline in unfilled orders has in the past generally anticipated a reduction in the price spread between finished steel and steel scrap. A decline in this spread, not narrow now, is almost certain to reduce steel.

Finished steel is high in comparison with general price indexes (Bradstreet's is the lowest since 1908) and, while it is above the 1922 low level, pig iron, scrap and such highly competitive items as sheets and nails are all much lower.

Reasons for anticipating somewhat lower scrap prices follow: Considering the level of steel prices, steel production has increased too sharply in comparison with pig iron production, a condition which usually brings a reaction and lower scrap markets. The sharp decline in unfilled orders, and other evidence of reduced steel demand, points the same way.

Pig iron market indications are mixed. An increase in steel production would ordinarily indicate a stronger market, but this condition being due to a November jump in Bessemer steel hardly seems conclusive. Pig iron is relatively dear, whether compared with finished steel or with steel scrap. In view of the outlook for weakness in these markets, and the virtual absence of first-quarter inquiry for pig iron itself, the probability appears to be against any rise in pig iron and in favor of further decline.




STEEL production made a gain in November which was not seasonal. Pig iron kept on going down. Unfilled orders of the Steel Corporation receded, also, to the lowest level since 1910. And pig iron prices dropped further, accompanied by a decline in scrap.

# This Issue in Brief

**Cutting tool efficiency easily determined** by measuring motor power consumption. Electric indicating instrument helps find the proper tool angle, rake, cutting material, grind, etc.—Page 1538.

* * *

**Are your machine tools "overmotored?"** Most are. Getting the right size motors will cut your power bills.—Page 1541.

* * *

**For best results in extra deep-drawing,** sheets should be normalized at 1700 to 1750 deg. F. Increased soaking time eliminates internal strain.—Page 1543.

* * *

**To avoid red-shortness in forging "free-machining" rustless steels,** preheat in a separate furnace before placing in forging furnace. Forge at 2100 to 2200 deg. F.—Page 1546.

* * *

**Cut cost of bright-annealing steel sheets and strips** by electric heating in atmosphere derived by "cracking" ammonia. Consumption is 6 to 8 cu. ft. of gas an hr. per ton product.—Page 1548.

* * *

**Assembly costs reduced by use of roller conveyor** with turntables built in every few feet. Turntables allow workers to turn gasoline pumps to most convenient position for assembling, painting, and testing.—Page 1552.

* * *

**Heat-treating fuel is conserved** by firing the cold furnace hard at first and dropping the fuel input as the desired temperature is approached. Auxiliary burners for lighting up are often an economy.—Page 1557.

**Hardening in salt bath** is accomplished with least decarburization in pure nitrogen atmosphere. Oxygen from the air is chief cause of decarburization.—Page 1554.

* * *

**Rustless steel stamping and copper sheet drawn together** to form cooking utensils with maximum heat conductivity and acid resistance. Edge is welded to provide a liquid-tight joint.—Page 1555.

* * *

**More tungsten-carbide cutting tools honed than lapped.** Only two companies of 73 reporting lap all tools; 15 lap some tools; 37 hone; 15 hone all tools.—Page 1561.

* * *

**Abnormal power consumption warns of defective machine tool** or cutting tools. Sprung shafts, tight bearings, defective oil systems, dull tools and other defects are reported by indicating instrument.—Page 1539.

* * *

**Make certain that your motor is large enough** when using cemented carbide cutting tools. A 35-hp. motor proved inadequate for a lathe, normally employing a 20-hp. motor, when c.c. tools were used.—Page 1542.

* * *

**Fight to maintain price levels,** urges Labor Federation head. Wants wage earners' income increased so that buying power will balance with production.—Page 1602.

* * *

**What is Ford waiting for?** Are last-minute mechanical changes or poor market conditions responsible for postponements? Ford steel buying program is still unexecuted.—Page 1518.

**Unfilled steel orders lowest since 1910.** For the first time in 21 years the Corporation's tonnage on order dips below three million.—Page 1602.

* * *

**What's happening abroad.** Doubt increases that England will place a tariff soon on iron and steel. Czechoslovakia takes Soviet wheat in exchange for 50,000 tons of steel. Germany brings out a corrosion-resistant steel piling (not copper-bearing).—Pages 1602-3.

* * *

**Do your steel specifications work against you?** Frequently the consumer specifies incongruous properties, which, when satisfied, result in a poor steel.—Page 1574.

* * *

**Tantalum-carbide tip-cracking after brazing is prevented** by setting tip in insert of pure molybdenum, which expands at same rate as the cutting alloy.—Page 1567.

* * *

**Centrifugally-cast brake drums in new Graham car.** Molten iron is poured into a steel jacket rotated at high speed.—Page 1579.

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**Don't worry about inclusions** not visible in steel at a magnification of 100 diameters. The smaller ones affect the steel very little.—Page 1574.

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**"Cold, statistical viewpoint" indicates further steel price reductions,** says Dr. Haney.—Page 1571.

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**Freight rates probably to be advanced Jan. 1.** Strike threatens if railroad wages are cut.—Page 1577.

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## NEXT WEEK

**IS the machine really a Frankenstein? Would we be better off with a return of the "good old days" when mechanization was still in its infancy? We have heard much about the failings of the machine from people who have no practical knowledge of it. A man who has been closely identified with production will tell what he knows about the machine next week.**

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# Taking Care of Inclusions in Steel

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**A PLEA is made for better cooperation in specifications between steel maker and customer. Users' stipulations often defeat their own purpose, through ignorance of operating conditions in maker's plant.**

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AT the Steel Treaters' convention in Boston the sixth Campbell Memorial Lecture was delivered by Dr. Charles H. Herty, Jr., of the United States Bureau of Mines, immediately following the annual business meeting of the society. Dr. George B. Waterhouse, Massachusetts Institute of Technology, presided.

Dr. Herty's subject, "Inclusions in Steel," is one to which he has devoted a very great amount of attention during the past several years. His lecture brought out the point that the consumer of the steel can do as much to help himself get the steel he wants as the producer can, provided the consumer will see that his specifications are so written that the steel maker has a fair chance.

Making a general survey to show what types of inclusions are harmful and what are not, Dr. Herty divided his subject into three parts—(1) what inclusions are in steel; (2) how they get there and how they may be controlled; (3) what may be the effects of inclusions.

A further subdivision in studying the subject was made, again under three heads: Inclusions visible at a magnification of 250 diameters; inclusions not visible at 250 magnification, but consisting of non-metallic matter out of solution; and solid solutions. In the first group were discussed the silicates, oxides and sulphides.

An equilibrium factor between manganese and sulphur was mentioned, which turns out to be 0.07 when the two percentages are multiplied together. On this basis, if the original pig metal contains 2 per cent of manganese, this will be a large factor in getting the sulphur down to 0.035 per cent by the time the iron gets into the mixer. If, on the other hand, there is only 1 per cent of manganese, there can be no elimination of sulphur unless the sulphur content is above 0.07 per cent, in which case it may be brought down to that figure. In any event, elimination of sulphur through the agency of manganese is a function of temperature to a considerable extent.

Inclusions not visible at 250 magnification may be exceedingly numerous. Each increase in the magnifying power shows up more and more particles in the steel. When one reaches 1500 diameters it may take a man all day to count the fine inclusions in a sample on glass. The effect seems to be like that of a powerful telescope, which brings out more and more stars on a clear night which were utterly invisible with less power of lens.

Solid solubility of various materials in steel is subject to varying rates of diffusion. Dr. Herty gave some coefficients for a number of materials as follows: MnS, 29; MnS plus FeS, 720; FeS, 1147; FeO, 1434; FeC, 57,300.

A strong plea was made for a standardization of methods of study, so that one investigator's work may be compared with that of another. In particular, the methods of polishing the specimens to be observed should be so standardized that every one can be sure of inclusions when they are discovered, and can be sure what those inclusions are.

### Sources of Inclusions

Once again dividing the matter into three parts, Dr. Herty referred to the sources of inclusions as being refractories, raw materials and deoxidation. As to refractories, the speaker said that, while these may get into the steel, they are very much the exception. The particles are big enough in almost all cases to float up through the liquid metal and into the scum or slag on top, without remaining to cause interior damage.

Non-metallic materials coming in with the pig iron and scrap in the open-hearth charge are usually not a serious problem, for the scrubbing action in the bath eliminates them pretty thoroughly. On this point, however, Dr. Herty mentioned the continuing studies which he has been reporting semi-annually to the open-hearth committee of the American Institute of Mining and Metallurgical Engineers, wherein he shows a gradually increasing content of a number of extraneous elements in steel, the source of which is traceable almost directly in most cases to the scrap used.

Deoxidation is the most fruitful and the most troublesome source of inclusions in steel. The concentration of iron oxide in the slag more or less controls the oxidation in the steel, but there is so much interaction going across the interface between steel and slag that a critical condition often exists in which inclusions might readily pass into the steel.

There are three ways to deoxidize steel: It may be done in the mold and the ladle; it may be done all in the ladle; it may be done as far as possible in the furnace, and then completed in the ladle. It would be ideal if we could do it all in the furnace, but this is not feasible because of the oxidation to which the steel is subjected as it is poured from the furnace into the ladle and thence into the molds.

When deoxidizing in the mold and ladle, one often obtains a dirty steel. This, however, is the cheapest way to perform the operation. There is a smaller loss of the deoxidizing elements, and steel made on this basis will readily pass ordinary specifications for the general run of uses.

Deoxidizing in the ladle does not give the steel very much chance to get rid of inclusions. On a large heat with a ladle as much as 12 ft. deep inclusions from the bottom must rise up through this 12-ft. head of molten metal within 15 min. Only the largest of them can do this.

In the furnace, however, inclusion

particles have only from 24 to 36 in. to rise and they have 20 or 30 min. in which they can do it after formation. Furthermore, the melter has within limits complete control of his furnace, including its atmosphere and to a large extent the slag, and by judicious use of what he has he can govern pretty closely what will take place. A handicap here is, however, that the interaction between slag and steel at the interface is such that the slag is always trying to put oxides back into the steel.

### Segregation and Blowholes

Segregation of silica has been found to reach a maximum at a section in the steel where there is a change in crystallization. A sample shown on the screen had the silica content nearly uniform at about 0.022 per cent, clear across from skin of ingot to center, except for a large hump to about four times that concentration, 0.090 per cent, about half way from the center. This was a killed steel and a higher magnification showed that, at the point where the hump in silica occurred, there was a distinct change in the form of crystals constituting the metal.

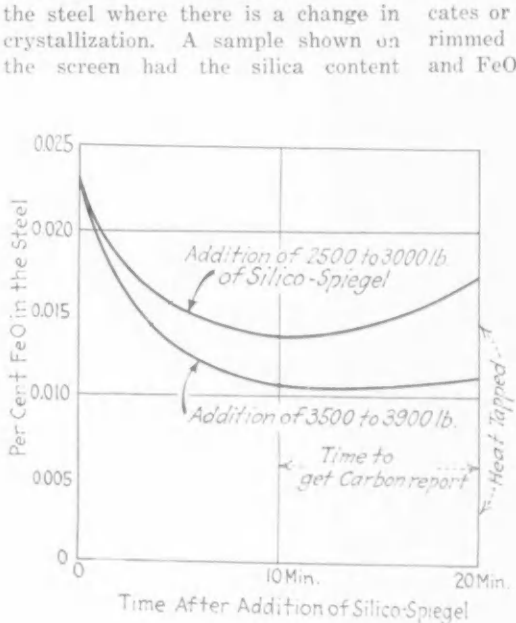
One great advantage of rimmed steel for certain types of work lies in the ability of the steel maker to locate his blowholes just about where they are wanted. When these are approximately half-way between the skin and the center of the ingot, the skin has a dense and tough structure and so has the center. For most uses for which rimmed steel is used, this condition is exceedingly acceptable.

### Effect of Inclusions in Steel

Inasmuch as the effect of inclusions in alloy steels is pretty much the same as in plain carbon steels, and they are from the same source, Dr. Herty confined his discussion of this topic to the plain carbon steels. The mere presence of some of the alloys tends to complicate the subject and adds nothing to an understanding of it

For deep-drawing steels silica gives rise to internal seams. Blowholes, on the other hand, especially those located near the surface, give rise to external seams, which show up as a series of cracks during the forging and rolling processes. Improper heating was said to be largely responsible for this latter condition.

How the steel is deoxidized determines largely whether it will have seams or not. The speaker believes that seams always have either silicates or sulphides in them. Seams in rimmed steel sometimes have MnO and FeO also.




SHOWING how inclusions are held down by addition of a sufficient quantity of the deoxidizer.

In certain cases the heat treatment to which the steel is subjected may result in a dirty steel testing to the same physical properties as a much cleaner steel. In most commercial steels, however, dirty steels are apt to give erratic results. In contrast, clean steels give dependable results, particularly as to fatigue tests.

Referring again to inclusions traceable to the raw materials, particularly scrap, Dr. Herty stated that the average of the extraneous alloying elements in plain carbon steels runs about 0.15 per cent. In some cases the total goes as high as 0.48 per cent. This includes certain proportions of tin, copper, nickel and chromium.

### General Conclusions

1. Before finding out all about this subject, we must have for observation a series of pure metals and a series of pure alloys to work from. If then we find out what these are good for, we can try variations in proportioning them with each other, and thus have a series of dependable combinations about which we may learn to know a little something.

2. Confining our worry about inclusions to those visible at a magnification of 100 diameters, we shall get rid of practically everything which is going to do damage. Inspection to these limits will take care of the large inclusions, and it is only the very large ones in general which do us much hurt. This may have to be modified somewhat when the material is subjected to fancy heat treatments, but it is a good rule for average practice.

3. Consumers can do as much toward helping to get clean steel as the steel manufacturer can do in producing it. Consumers' specifications are often poorly conceived. They restrict the manufacturer unduly in his ability to manipulate his raw materials. Physical specifications as well as chemical specifications frequently are outside the range of what is practical, particularly when the two are demanded in combination. We must contrive to get a specification from the consumer which will make the steel react in his favor instead of against him.

Only too often does a consumer specify a certain range of properties which is utterly out of keeping with a certain other range he specifies in some other property. Even if the steel maker can satisfy both ranges simultaneously, which often he cannot, the handicap occasioned in the making of the steel may result in some other deleterious property, not covered by the specifications but extremely damaging to the material in use.

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"Relative Heat Transfer Through Refractories," by A. S. Watts and R. M. King, professors of ceramic engineering at Ohio State University, has recently been published as Bulletin 64 of the Engineering Experiment Station. This bulletin covers the development of a practical control method for the determination of relative heat transfer through refractories. It also includes 13 tables of data on composition, temperature gradients, insulating values, heat transfer values, and porosity of a number of samples of brick furnished by many well known manufacturers of refractories.

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Total 1929 motor vehicle sales by 245 plants were $3,713,853,000, of which $1,416,361,000, or 38.1 per cent, represented retail sales, according to the Census of Distribution. Sales to wholesale distributers aggregated $1,234,413,000, or 33.2 per cent of the total.

# Congress Shows Strong Inclination to Favor Domestic Rehabilitation Programs

By L. W. MOFFETT

WASHINGTON, Dec. 15.—Fresh from their constituencies from all over the land, members of Congress have come to Washington with a decidedly domestic complex. Thoroughly impressed by the industrial, agricultural, unemployment and financial conditions growing out of the depression, they have developed a determination to direct their attention to home affairs before considering foreign relations.

While they are chided from some sources for their so-called provincialism, the criticism is carrying little weight. This is due partially to the fact that many business and other interests are supporting their position and urging the pressing need of looking after conditions in the United States first.

President Hoover in his message has also laid before Congress a broad legislative program emphasizing the necessity of early action on domestic problems. At the same time there is a wide breach between the administration and members of Congress, some of them Republican leaders, as to foreign affairs. The outstanding indication of this difference was the refusal of Congress to ratify the moratorium on foreign debts, due Dec. 15, until legislative hearings had been held. This forced the United States to do the unusual thing of remitting payments, approximating $125,000,000.

### Domestic Problems Come First

Ratification of the moratorium is virtually certain, but not until Congress has conducted a rather sweeping quiz with particular reference to huge foreign loans by American financial interests. There are prominent members of Congress who plainly recognize that the United States cannot isolate itself from the rest of the world and to a degree at least they accept the idea of "international interdependence," but are showing a waning interest in European affairs and increased interest in domestic affairs.

Their attitude seems to be that, despite the tremendous scaling down of debts and large loans, European sickness grows, and the United States is imperilling its own interest if it proceeds much further in giving aid. This being the case, as members of Congress see it, they feel that, if a point of desperation and self-preservation has been reached, it is for them to give greatest attention to domestic conditions.

It is this attitude that was responsible for the unfavorable reaction toward the President's suggestion for the setting up of a war debts commission and his pronouncement that there must be further "temporary adjustments" of debts. It was contended that, lacking clearness, the phrase meant further scaling of debts. Whether the debts are ever collected, there is a strong sentiment in Congress against further scaling or cancellation. Since either means throwing additional burden in the way of higher taxation on the people and business interests of the United States, which shares depression with Europe and the world generally, the idea of further relief for Europe has evidently lost much of its appeal.

The President, however, expressed opposition to cancellation of the debts. The administration, of course, is against suggestions for widespread

## What Congress Has Done of Interest to Business

TAXATION — Vigorous opposition in Congress to administration tax program indicates necessity of compromise. Hearings to be held.

FOREIGN AFFAIRS — Determination of Congress to hold hearings on debt suspension before ratification forces Government to remit payments of $125,000,000 due Dec. 15 from 11 European countries.

RAILROADS — Senate adopts resolution by Senator Couzens, Michigan, chairman of Committee on Interstate Commerce, for Congressional inquiry into railroad situation. Inquiry will relate particularly to recommendations by Interstate Commerce Commission to see what Government can do to aid rail carriers and to so-called Government subsidies to competing lines, including motor, water, pipe and air carriers. Will also deal with movement to cut railroad labor wages. House adopts bill by Representative Rayburn, Texas, to place railroad holding companies under jurisdiction of Interstate Commerce Commission, as recommended by latter.

TARIFF — Senator Oddie, Nevada, and Representative Williamson, South Dakota, introduce bills to embargo imports of Russian manganese ore. Bills for duties on oil and copper. No tariff legislation of any kind appears probable at present session.

FINANCE — Senate Committee on Banking giving priority to President's recommendation for Emergency Reconstruction Corpn., a major part of domestic program, and likely will act this week. Same committee also preparing to act soon on suggested revision of national banking laws, including proposal to deny Federal facilities for use in speculation. President's recommendation for home loan bank system meets with stronger opposition than had been anticipated, but promises to be passed. Liberalizing of eligibility provisions of Federal Reserve act will be limited, if provided at all.

tearing down of tariff walls so that debts might be paid by heavy imports, which, it is held, would further depress American business and increase unemployment.

### Proposes Payment in Silver

In this connection, it is interesting to observe that Chairman Smoot of the Senate Committee on Finance, following a long conference last Saturday with President Hoover and Under-Secretary of the Treasury Mills, announced his plan to introduce a bill to permit foreign nations to pay their debts in silver. The present requirement is that these debts be paid in gold. It is a coincidence that almost simultaneously with this statement by Senator Smoot, Japan suspended gold payments, as was done recently by Great Britain, Scandinavia and other governments.

Senator Smoot claimed the proposal for payment in silver would aid the world situation and assist foreign nations in meeting their obligations. Silver, he said, would advance a little in price if "we would recognize a value to it and show that we are willing to accept it in payment of obligations." Senator Smoot's proposal has met with both support and opposition in Congress. Among the strongest opponents is his colleague, Senator King, of Utah. Senator King said the plan would mean the dumping of a large quantity of silver without giving it monetary status.

### Taxation Arousing Greatest Interest

Of the numerous domestic measures proposed by the administration, the most widespread interest concerns taxation because of its direct effect in all walks of life, both business and personal. To a large extent, President Hoover recommended reenactment of the 1924 revenue act. The administration proposes higher individual income, corporation and estate taxes as well as the reinstatement of numerous miscellaneous taxes or "nuisance" taxes. It seems highly improbable that the administration tax program will be enacted in its entirety. It is conceivable that only the proposal for higher taxes on large incomes and estates will receive favorable action in Congress. Democratic opposition is especially strong against the miscellaneous taxes. Many Republicans share the same view.

The automotive and other industries which would be faced with sales taxes are actively combatting the sales tax proposals. It is evident there is sufficient strength to defeat them if it is organized, as it likely will be.

As the House, the body which originates revenue legislation, is controlled by the Democratic party, the latter will have much to say as to the form of taxes. Some Democrats favor only slight increased taxation and the floating of bonds by the Treasury. Most of them favor higher taxes on the larger incomes, and exemption, as at present, of small incomes. The idea of "soak the rich" is not absent, though it hardly can be said to be of a marked character. It is realized that "soaking the rich" might be a good political theory, but that in fact it is not practical to the extent that it would appear to those who are aware that many riches have disappeared and that excessive taxation would turn to investment in tax-exempt securities.

It is an interesting fact that, of the many suggestions for raising taxation, there is generally a distinct tendency to go as lightly as possible on business.

Hearings will be held on proposed taxation measures by the House Committee on Ways and Means, headed by Representative Collier, Democrat, of Mississippi, a strong advocate of increased bond issues to take care of the large public works program the present session is expected to provide. Framing of the Democratic tax bill is under way. The work started with the Joint Congressional Policy Committee, made up of Democrats of both houses. The Democrats are strongly against making the increased taxes apply to 1931 incomes, as proposed by the administration.

### Will Pass Reconstruction Plan

One of the major measures of President Hoover, which likely will be reported soon by the Senate Committee on Banking and Currency, relates to the proposed $500,000,000 Emergency Reconstruction Corpn. It promises to be passed without any great difficulty. This measure will be similar to the former War Finance Corpn. and authorizes the Treasury to subscribe capital and issue its own debentures. The loans to American industry, railroads, agriculture and other domestic agencies would, it is claimed, do much to stimulate business and employment and go far toward recovery from the depression.

Whatever it may do, it is certain this present Congress is faced with economic problems of tremendous importance, perhaps more important than any since the World War, and it has its eye first on domestic conditions.

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# Bethlehem Steel Adopts New Plan of Relief at Lackawanna Plant

## Will Provide Some Kind of Work for All Employees With a Minimum Living Wage

THE Bethlehem Steel Corpn. has entered into a special arrangement of relief for workers at its plant at Lackawanna, N. Y., according to an announcement by Jesse Isador Straus, chairman of the State's Temporary Relief Administration. The plan is to provide at least a living minimum wage for all of the 7000 workers who might have had steady jobs at Lackawanna but for the depression. Even the stagger system of work relief, which has worked out well at many steel plants, has failed to meet the situation at the Lackawanna plant, it is said, and the new Bethlehem plan has been entered into so that none of the men shall become public charges.

Details of the plan were worked out under the supervision of E. G. Grace, president of Bethlehem, together with his special assistant, Joseph Larkin, and Timothy Burns, manager of the Lackawanna plant. The following announcement was issued:

1. The Bethlehem Steel Corpn. recognizes that the stagger-work plan, adopted early in the depression in order to spread available work over the payroll as widely as possible, has now reached the limit of its usefulness. It has been found that a large number of men are now getting less than is necessary to sustain life.

2. The Bethlehem Steel Corpn. recognizes that it has an obligation toward its employees to keep them from becoming relief charges upon the city of Lackawanna. It therefore volunteers to give relief work to all employees on its Lackawanna payroll who are receiving less than a living wage.

3. The Bethlehem Steel Corpn. as the largest taxpayer in the city of Lackawanna volunteers to support any appropriation which must be made by the city to care for other than Bethlehem employes.

Under the Bethlehem plan a minimum wage will be paid to all regular employees and some form of relief work will be afforded for them. The suggested minimum wage is $12 a week, though this has not been definitely agreed upon.

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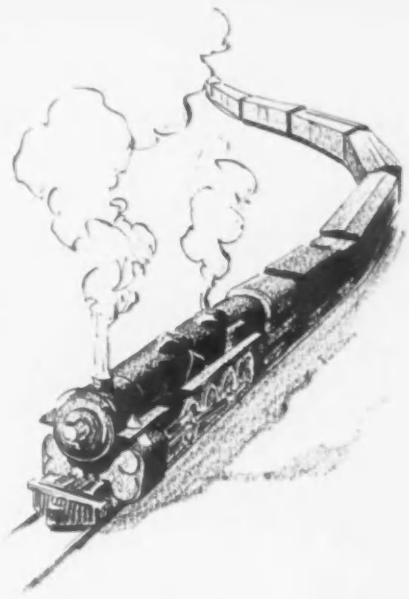
Pittsburgh-Des Moines Co., Pittsburgh, and the borough of Ambridge, Pa., who are jointly conducting an extensive test of paints for metal water tank interiors, have announced the results of the second inspection of 196 paint panels after 42 days' exposure. The three highest average ratings given in the 14 classified groups of paints that are being tested are as follows: hot bituminous coatings, 98.9 per cent; aluminum paints, 91.7 per cent, and asphalt emulsions (plain), 91.5 per cent. The average rating for all panels is 83.3 per cent.

# Freight Rate Increase May Take Effect on Jan. 1

### Negotiations Over Proposed Wage Reductions Still in Progress—Strike of Northwestern Men Threatens



WASHINGTON, Dec. 15.—Increased freight rates approved by the Interstate Commerce Commission in its decision in the so-called 15 per cent case will be made through the filing of a master tariff, according to reports here, and are expected to be made operative Jan. 1 or soon thereafter.

Meanwhile the Railroad Credit Corpn., which will administer the fund arising from increased rates, was incorporated in Wilmington, Del., yesterday. Temporary offices have been established in the Transportation Building in Washington. In accordance with a resolution adopted at the meeting here of the Association of Railway Executives last Friday, the various railroads are given until Dec. 21 to file their acceptance of the loan pool plan. E. G. Buckland, chairman of the board of the New York, New Haven & Hartford Railroad, was elected president of the corporation.

The railroad wage question is becoming more intense in view of the attitude of Chicago & North Western members of the Brotherhood of Railway Maintenance Employees, who, according to President Fred H. Fljozdal of the brotherhood, are voting strongly in favor of strike. Fear is felt that if a strike is decided upon by the brotherhood it will precipitate a general strike of railroad employees. The employees on the North Western took a strike vote following a wage reduction of 15 per cent made by that railroad. It has become a question now as to whether the employees will be compelled to acquiesce in negotiations for arbitration, starting the possibly long process with the United States Mediation Board.

An amicable adjustment of the railroad wage question through negotiation was in prospect, however, after the meeting of the Eastern Presidents' Conference in New York on Monday, when a committee was appointed to confer with the Railway Labor Executives' Association. This committee consists of J. J. Pelley, president, New York, New Haven & Hartford; Daniel Willard, president, Baltimore & Ohio, and Charles E. Denney, president, Erie. The Western and Southeastern railroads are expected to meet this week to consider similar action.

The statement of the Eastern Presidents' Conference concluded with the expressed hope that "this action will result in an early and amicable adjustment of the matters involved."

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# Progress in Iron and Steel Equipment and Methods

PROGRESS in development of iron and steel machinery during the year was outlined in a progress report of the Iron and Steel Division of the American Society of Mechanical Engineers, which was paraphrased by Leon Cammen of the society at a meeting on Dec. 3. In brief, the successive topics discussed were as follows:

In the manufacture of tubes and pipe, electric welding has undergone marked changes during the year. Notably, the Christy Park plant of the National Tube Co., which was described in THE IRON AGE of May 7 last, was mentioned as an outstanding part of this development. Another feature brought out is the substitution in some instances of the equivalent of a Stiefel mill in place of the Mannesmann mill in piercing and expanding steel during the process of making seamless tubes.

Stainless metals have undergone a decided development during the year, in many particulars.

Continuous sheet rolling has been further developed in the various plants where this is being prosecuted, including Ashland, Butler, Wheeling, Republic, Youngstown and, now, Inland. This process was said to be now the controlling element in the manufacture of sheets. Its advantage in cost is of the order of $5 to $7 a ton.

New developments in non-continuous mills for rolling sheets have included much higher operating speeds, with correspondingly increased output, against which must be set a higher cost of installation. As these mills operate faster than a man could catch and handle the sheets, mechanical catchers are used.

Blooming mill drives have undergone an improvement in the shape of the use of two motors—one for each roll—in a reversing mill. This has necessitated some special work on the electrical side, whereby the two rolls may be run at precisely the same speed.

#### Electric and Magnetic Aids

An electric system for screw downs in beam mills was mentioned, which does away with uncertainty in gage, and results in working each blank exactly the same as each other blank going through the mill. Photoelectric cells are coming into greater and greater use in controlling the operation of mills and other apparatus.

There is a further tendency toward the use of non-destructive tests for steel. It is conceivable that the time may come when every piece of steel will have to undergo test before being shipped. In this work the use of gamma rays is increasing, these having been found for some purposes much superior to the ordinary X-rays. Discovery of flaws by magnetic means is proceeding apace.

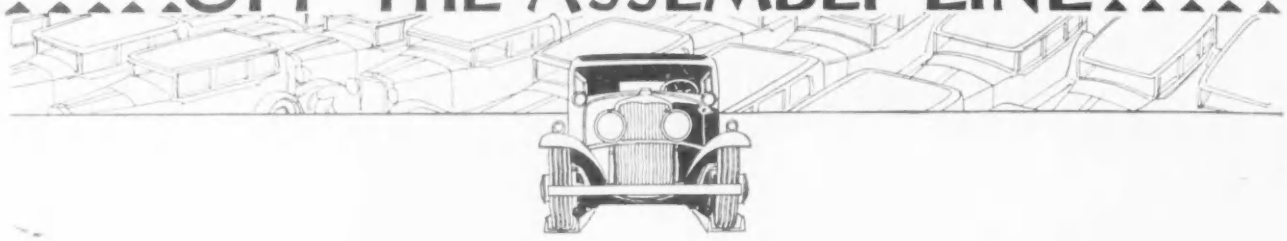
Hardening of steel in a rotating magnetic field is reported as affecting the atomic structure of the iron itself.

Welding has progressed rapidly in many particulars. Putting a facing of hard material on a soft body or base, sometimes in association with rolling, was mentioned as a recent development in this field.

A new mill for hot strip and sheet rolling, operating up to 44 in. in width of product, was reported. This is used on stainless and other special alloys, and supplements the cold rolling of a similar type of mill which has been in operation for some little time.

Better use of gases of low calorific value is reported to have been forced by the current economic situation. In particular, blast furnace gases and coke oven gases have been put to work as never before. There appears to be just about enough of these two types to run the steel industry.

# ....OFF THE ASSEMBLY LINE....



# Delays at Rouge Plant Hold Back Ford Production of New Models

DETROIT, Dec. 14.

WITH further delays by the Ford Motor Co. in placing orders for steel and for various parts, Detroit is convinced that little can be expected from Dearborn in the way of production this month. It is known that a few weeks ago the steel buying program was mapped out and apparently was to be carried out according to schedule, when suddenly plans were switched and a series of postponements has left the steel trade as well as other suppliers in a discouraged mood. It is freely acknowledged locally that Mr. Ford holds the key to the automotive situation and upon what he does depend the actions of most other manufacturers. That is, every company is anxious to see what Mr. Ford has to offer and to observe its reception by the public; therefore, all are proceeding slowly with their own plans until he comes out in the open with his new product.

Just what is causing the delay at Dearborn is the center of discussion here. It is asserted that last-minute mechanical changes have been a factor, and then it has been suggested that Mr. Ford is fully aware of the fact that the market for automobiles just now is poor and nothing will be lost by getting under way at a leisurely pace.

The Ford company is understood to be planning on building an eight-cylinder car with a V type motor to replace its present model A. On account of the retooling which is necessary for the new job, production at the Rouge plant is not likely to get into a volume basis before Jan. 15. In view of this program, Ford probably will not place its first quarter steel orders for another week or 10 days.

**Ford's December Output Slim**

December production of 20,000 cars by the Ford company, a schedule much heralded a week ago, now seems improbable of attainment. In fact, it now looks as though the number of assembled cars this month will be exceedingly slim. The Christmas holidays are close at hand and Ford usually has closed the Rouge plant for a two weeks' period at that time. The company's intention this year is not known, but it is reasonable to believe that it will not attempt to expand activities to any marked extent until after the year-end. Although certain parts makers have received substantial releases on orders, others are still without instructions, despite the fact that it will take them 10 days to two weeks to begin making deliveries after they get word to go ahead. Murray Corpn. has an order for 5000 Ford frames and has bought some steel for this job from Great Lakes Steel Corpn., which is next door to its Ecorse plant. While Murray has been running trial lots of frames through its new department, work is not expected to be put on a production basis until the end of the month.

One story repeated on numerous occasions in local circles has it that the new Ford will have a wheelbase considerably longer than the 1932 Chevrolet, but there is little foundation for this belief. The wheelbase will be increased by comparison with the present model A, but not to such a radical extent. The use of rustless steel will be confined to the lamp shells and hub caps, the change to carbon steel for the radiator shell being severely felt by two rustless steel producers.

**Ford production this month and next not likely to be more than 75,000 to 100,000 cars, due to further delays at Rouge plant.**

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**Chevrolet will make 50,000 cars in January.**

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**Graham eight has "banjo-type" frame of new design.**

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**Auburn will be first company to produce a 12-cylinder car in the medium-price class.**

**Chevrolet Buys Steel**

Chevrolet bought some steel for its gear and axle plants the past week and Fisher Body purchased sheet steel for its Cleveland factory which makes Chevrolet bodies. Chevrolet is planning to turn out about 50,000 cars in January. Its new car has been received with enthusiasm and its officials are gratified at the interest shown by the public. Auburn is preparing its 12-cylinder car, which will be priced at a relatively low figure, and the Lycoming Mfg. Co. will make 400 motors this month and 1600 in January for the new job. Apparently Auburn will have the distinction of being the first manufacturer to put a 12-cylinder car on the market at a figure within the reach of the man of moderate means. It is understood that Auburn is counting on this move to hold and consolidate its gains of the past year. With Lincoln, Pierce-Arrow, Cadillac and Auburn already in the 12-cylinder field, it looks as though production in that class will take a sharp rise during 1932.

Nash is designing five new groups of cars which will not be exhibited at the January shows, but will be held for disclosure at the beginning of the spring selling season. Plymouth is following the same plan. So far as Plymouth is concerned, the only major change will be in body design. Hupp is understood to have a car of the so-called "tear-drop" body lines, with some modifications, ready to reveal next month. Withholding its new models until the New York show, Hudson will incorporate many improvements in its line, with the body design created to give the impression of fleetness.

**Graham Offers "Blue Streak" Eight**

The new Graham Blue Streak eight, having a 123-in. wheelbase and 90-hp. engine with aluminum head, is priced

at $995 to $1,170, considerably below the previous range. This car is of unusually advanced engineering design, offering dash-controlled shock absorbers (so-called "ride control"), free wheeling, hydraulic brakes with new "centrifuse" drums, synchro-silent, gear-shift transmission, resonator-type exhaust silencer, and cool gas system.

The body is stream-lined with sloping windshield, no outside sun visor and V-type slanting radiator. The hood likewise is rounded to give the appearance of speed. Fenders are shaped so that they completely conceal the chassis and running gear, only the road wheels being visible. The use of chromium is confined to the radiator grille, hub caps, door handles, bumpers, windshield frame and a narrow bead around the headlight lens. That is, color has been substituted for chromium to heighten the effect of unity.

**"Banjo Type" Frame**

There has been a notable decrease in the overall height, the sedan roof being only 5 ft. 9 in. above the road. Other models are even lower. The effect is to add greatly to the apparent length of the car. A strikingly new frame construction of the banjo type is one of the features of the Graham. Instead of being carried on top of the springs, with high "kick-ups" over the axles, the frame is lowered between the springs, which are set far apart. At the rear of the frame, in order to eliminate the high "kick-up" formerly required to allow sufficient clearance over the axle, the top and bottom flange of the side rail diverge, forming an oval that gives the name "banjo type" to the new design.

The "head" of the banjo is cut out to provide space for normal axle movement. In place of the usual decrease in stiffness of the rails over the rear axle, the new design, running both over and under the axle, results in increased rigidity. Ample clearance over the front axle without a "kick-up" is made possible by the outboard mounting of the springs.

Besides the main transverse braces, the frame has deep U-section cross members slung underneath the side channels and extending on each side, forming strong supports for the running boards and fenders. Diagonal braces extend inward from the top flange of the side rails and join the cross members, forming strong knee braces to restrain twisting. The steering gear housing is bracketed on top of the side rails, the shaft running over instead of through it. All spring mountings are of the rubber compression type. Summed up, the effect of the new Graham design is to lower both the frame and the body without affecting the clearance over the axles and to drop the center of gravity of the body with a marked improvement in riding and roadability as a result.

The brake drums on the Graham have a cast iron braking surface in a steel jacket. The drum is made by pouring molten iron into the drums while they are being rotated at high speed. The liquid iron, under centrifugal force, forms a dense layer around the inner surface of the rim and in hardening becomes an integral part of the assembly, firmly fused to the steel jacket. In the front-end construction, the cowl, windshield frame, top header, dash and floor board and instrument panel supports are welded to form a single unit. An unusual stamping forms in a single unit the entire windshield frame, the vertical risers from the floor to the windshield and the front roof panel over the windshield.

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Although Murray Corpn. has just obtained a contract to supply Ford passenger car frames, it has been making Ford commercial car frames for more than a year.

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Steel contracts for the first quarter are expected to be placed this week by Chrysler, Chevrolet and Buick. Local mills have profited considerably in the last two weeks from pick-up orders for prompt delivery by truck.

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The season's last water shipment of sheet bars was made the past week from Cleveland to the sheet mill at Monroe, Mich.

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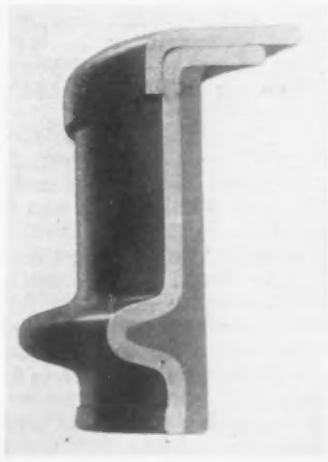
## Graham Car Brake Drums of Steel and Cast Iron

The "centrifuse" brake drums on the new Graham car consist of an outer steel ring, flanged and ribbed, into which is centrifugally cast an inner thickness of cast iron. The steel and iron ring then is welded to the steel back, which is bolted to the wheel in the usual way. The new drum combines the advantages of cast iron, as used in high-speed buses and heavy-duty trucks, with the superior lightness and strength of pressed steel.



## 58 Per Cent of Farms Have Automobiles

WASHINGTON, Dec. 15.—There were 4,134,675 automobiles on 3,650,003 farms, or 58 per cent of all farms in the country, on April 1, 1930, according to the Director of the Census.

The number of other kinds of motor equipment on farms reporting to the Bureau of the Census follows:

| | Number | Farms Reporting | Per Cent of All Farms |
|---|---|---|---|
| Motor trucks | 900,385 | 845,335 | 13.4 |
| Tractors | 920,395 | 851,457 | 13.5 |
| Electric motors | 1,381,191 | 256,663 | 4.1 |
| Stationary gas engines | 131,108 | 945,000 | 15.0 |

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## Foundrymen Will Discuss Castings Design

Castings design will be the chief topic of discussion at a special meeting of the Philadelphia Foundrymen's Association and American Foundrymen's Association members within the Philadelphia district, at the Manufacturers' Club, Philadelphia, Jan. 13. Problems of castings design for various cast metals will be presented by H. J. Rowe, technical control and development section, Aluminum Co. of America, Cleveland; K. V. Wheeler, general manager, Lebanon Steel Foundry, Lebanon, Pa., and B. H. Johnson, R. D. Wood & Co., Philadelphia. Members of the Philadelphia section of the American Society of Mechanical Engineers have also been invited to participate in the meeting.

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## St. Louis to Honor Old Companies

Executives of 85 corporations and firms which have been in business in St. Louis for 75 years or more will be honored at the annual meeting of the Industrial Club of St. Louis at Chase Hotel on Dec. 17. Among these old-timers are: Beck & Corbitt Co., Bridge & Beach Mfg. Co., Charter Oak Stove & Range Co., Curtis Mfg. Co., Fulton Iron Works, C. Hager & Sons Hinge Mfg. Co., A. Leschen & Sons Wire Rope Co., Ludlow-Saylor Wire Co., Pauly Jail Building Co., Shapleigh Hardware Co., Simmons Hardware Co., Stupp Brothers Bridge & Iron Co. and Witte Hardware Co.

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The 1204 plants in the non-ferrous metals and alloys industry which reported to the Census of Distribution made sales aggregating $824,429,000 in 1929. Sales to industrial consumers were $580,176,000, or 70.4 per cent, of the total. The plants covered are those engaged primarily in rolling, drawing or casting non-ferrous metals and alloys and in producing such alloys.

# ...OBITUARY...

WILLIAM W. BLACKBURN, who had been vice-president and secretary of the Carnegie Steel Co., Pittsburgh, for 26 years prior to his retirement in 1927, died at his home in Pittsburgh on Dec. 11. He was born at Hollidaysburg, Pa., in 1859, and in early life went to Pittsburgh, where he began work as a bookkeeper for the Wilson, Walker Co. He continued with the company after it was absorbed by the Carnegie Steel Co., and served for a time as assistant superintendent of the old Twenty-Ninth Street mill in Pittsburgh. He later entered the financial department and became assistant treasurer. He was made secretary in 1899, and vice-president and secretary in 1901. He was a member of the American Iron and Steel Institute, and was also prominently identified with philanthropic work in Pittsburgh.

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HOWARD RANKIN SARGENT, engineer of the merchandising department of the General Electric Co. at Bridgeport, Conn., died on Dec. 8 at his home in that city after an operation for appendicitis. He had been associated with the General Electric Co. since 1892. Mr. Sargent was 60 years old and was born in Newton, Mass.

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FREDERICK L. NAYLOR, president, Naylor Pipe Co., Chicago, died Dec. 9 after an illness of two weeks. He was 60 years old. Mr. Naylor was a native of Mason City, Iowa, and was graduated from Northwestern University. For a number of years he had been connected with the Illinois Central and the Burlington railroads.

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CHARLES N. KALK, for many years chief engineer, Wisconsin Central Railway, with headquarters at Milwaukee, and later chief engineer of Minneapolis, St. Paul & Sault Ste. Marie Railway, with headquarters at Chicago, died Dec. 7 at his home in Seattle, Wash., where he resided since his retirement in 1922. He was 70 years of age.

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CHARLES H. JULL, vice-president of the Pittsburgh-Erie Saw Corpn., Pittsburgh, and president of the Pittsburgh Good Will Industries, died suddenly on Dec. 10 in Buffalo, where he had gone on a business trip. He was born at Erie, Pa., 56 years ago and was engaged in the manufacture of saws for 20 years, operating under the name of the Erie Saw Co., Erie, before that concern was merged with the Pittsburgh Saw Co. in 1917 to form the present corporation.

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CHARLES G. NOBLE, secretary of the Bailey-Farrell Mfg. Co., Pittsburgh, maker and distributer of plumbing and heating equipment, died on Dec. 11 at his home in Pittsburgh, aged 64 years. He had been associated with the Bailey-Farrell company for 47 years.

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GUSTAV VON DEN STEINEN, president, Glascote Co., Cleveland, died Dec. 4. He was formerly prominently affiliated with the lake shipping industry in Cleveland.

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WILLIAM J. ERDLE, since 1909 president and treasurer of the Erdle Perforating Co., Rochester, N. Y., died after a long illness at his home in that city on Dec. 6.

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OLIVER C. SMITH, president and general manager of Smith & Egge Mfg. Co., Bridgeport, Conn., died at his home in that city on Dec. 7.

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ROBERT A. WALKER, for more than 40 years associated with THE IRON AGE in its Pittsburgh office, died at his home in Seattle, Wash., on Dec. 14, aged 69 years. He was born in Allegheny, Pa., now North Side, Pittsburgh, and entered the employ of THE IRON AGE at Pittsburgh when he was 16 years of age. The Pittsburgh office was at that time in charge of the late Joseph D. Weeks, and when the latter became identified with the *American Manufacturer*, an iron and steel trade paper, MR. WALKER became manager of THE IRON AGE at Pittsburgh. For 15 years he was in charge of both advertising and editorial work, and from 1911 until 1920 he was concerned exclusively with editorial work. During the next four years he served as resident editor at Pittsburgh for *Hardware Age*, and since his partial retirement in 1924 he had served as correspondent in the Pacific Northwest for THE IRON AGE.

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## Construction Contracts Downward in November

With only one important territory in the 37 States east of the Rockies showing a gain in new construction contracts, retrenchment in building and construction continued unabated during November, according to the F. W. Dodge Corpn. figures. The advancing district was the Central Northwest territory, comprised of Minnesota, the Dakotas, the northern peninsula of Michigan and northwest Wisconsin. Its total of $6,900,600, comparing with $4,851,000 in November, 1930, showed gains in all three major construction groups.

Total construction contracts awarded in November in the entire 37 States east of the Rockies amounted to $151,195,900. This was divided among the three major classes, with $45,290,400 in residential building, $58,495,800 in non-residential building, and $47,409,700 in public works and utilities. The loss from October, when large contracts for Radio City, New York, swelled the total, amounted to 38 per cent as contrasted with a customary seasonal decline of less than 15 per cent.

Public buildings were alone in the non-residential group to advance during November and also for the 11 elapsed months of the year, for which a gain of 39 per cent was shown as compared with the corresponding period of 1930. The decline in commercial buildings was 49 per cent, while factories showed a loss of 53 per cent.

Residential gains over November, 1930, were scored during the month just ended in New England and the Central Northwest. Non-residential building advances were made in the metropolitan area of New York, Middle Atlantic, Southeastern and Central Northwest districts. Increases in public works and utilities were registered in the New England, upstate New York, Central Northwest and southern Michigan territories.

The five territories showing the largest totals during November were metropolitan New York, with $33,000,300; New England, with $17,104,200; Middle Atlantic, with $21,431,500; Pittsburgh district, with $15,610,000; Chicago district, with $13,640,700.

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## Importers Appeal Case of Bar Duty on Angles

Importers of steel, who have just been denied a rehearing by the United States Customs Court on the classification of bar sized angles as bars, dutiable at 30c. a 100 lb. instead of as shapes dutiable at 20c. a 100 lb., have filed an appeal before the United States Court of Customs and Patent Appeals, Washington. The case, which has been in the Customs Courts for the past two years, was originally decided in favor of the importers' contention that bar sized angles are shapes. The case was appealed, however, and decided for the Government, after which the request of the importers for a rehearing was refused.

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"Sil-Fos," a new low melting point alloy recently developed by Handy & Harman, 57 William Street, New York, has been patented. It is recommended by the manufacturers for use on copper, brass, bronze, nickel, nickel-silver, extruded brass and bronze, Monel metal and other nonferrous metals and alloys fusing above 1300 deg. F. It is said to contain a sufficient percentage of silver to give it easy flowing, penetrating and alloying properties. Tests on copper lap joints are reported as showing tensile strength varying from 30,000 to 35,000 lb. per sq. in. The melting point is given as 1300 deg. F.

# ... PERSONALS ...

ROBERT H. MORSE, formerly vice-chairman of the board of directors, Fairbanks, Morse & Co., Chicago, has been elected, as reported in THE IRON AGE of Dec. 10, to the position of president and general manager to succeed W. S. HOVEY, who has resigned. Mr. Morse is director also of E. & T. Fairbanks & Co., Canadian Fairbanks-Morse Co., and the Central Republic Bank & Trust Co., Chicago.

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CHARLES C. DAVIS, president, Pennsylvania Forge Co., Philadelphia, has been appointed director of the Department of City Transit for the new city administration. Mr. Davis is an engineer and has made a careful study of the transit situation in Philadelphia. Born near Norristown, Pa., he was graduated in engineering from the University of Pennsylvania in 1897. He was employed by the Pencoyd Iron Works, Pencoyd, Pa., and later was an engineer in the Philadelphia gas works of the United Gas Improvement Co. In 1899 he was made assistant chief engineer of the Midvale Steel Co., Midvale, Pa., and in 1908, with others, he acquired the plant of the Pennsylvania Forge Co. After two years as secretary and treasurer of the company, he became president.

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T. S. HAMMOND, president and general manager of the Whiting Corpn., Harvey, Ill., has been appointed a brigadier general to command the 65th Infantry Brigade, Illinois National Guard. Prior to receiving this commission he was colonel of the 124th Field Artillery, I. N. G. General Hammond has served on the Mexican border and in France.

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WILLIAM H. WAITE has been appointed sales manager of the Browning Crane & Shovel Co., Cleveland, succeeding R. G. MILLER, JR., who has resigned. Mr. Waite previously was connected with the New York sales office.

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CAPT. LOUIS SHANE, manager of the Portsmouth, N. H., navy yard, will be detached Jan. 26 and assigned to duty at European navy yards to gather technical information regarding steel in naval construction. His place will be filled temporarily by CAPT. J. W. WOODRUFF, shop superintendent.

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C. N. BRUBAKER and L. S. SCHELL, engineers at the General Electric Co., Erie works, are to be temporarily transferred to the company's Pittsfield, Mass., transformer department.

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FRED W. BUSCHE, for more than 10 years in charge of the foundry division of the Prime Mfg. Co., Milwaukee, has been named vice-president and sales manager of the Iroquois Foundry Co., Racine, Wis.

ROBERT H. MORSE

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S. LIVINGSTON MATHER, vice-president of the Cleveland-Cliffs Iron Co., Cleveland, has been reelected president of the American Mining Congress.

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C. J. MCCAFFREY, formerly assistant division manager at Albany, N. Y., for S. F. Bowser & Co., Fort Wayne, Ind., has become identified with the Ward Hydraulic Hoist & Body Co., a division of Gar Wood Industries, Detroit.

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HARRY J. HOSKING has resigned his position in the research laboratory of the Roessler & Hasslacher Chemical Co., Niagara Falls, N. Y., to take up similar work with Foster D. Snell, Inc., Brooklyn, N. Y.

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JOHN ANDERSON, assistant to J. G. BARRY, vice-president of the General Electric Co., has been appointed secretary of the sales committee, succeeding E. G. WATERS, who is retiring at his own request on the completion of more than 42 years of continuous service.

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DR. V. O. HOMERBERG, technical director, Nitralloy Corpn., New York, is scheduled to speak on the "Nitriding Process or Nitralloy" at the regular monthly meeting of the New Haven, Conn., chapter of the American Society for Steel Treating at the Chase Co. Auditorium, Dec. 17.

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DR. W. R. INGALLS, consulting mining engineer, New York, has been reelected president of the American Institute of Weights and Measures.

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DAVID S. HAYS, who has been associated with the steel plant equipment department of the Blaw-Knox Co., Blawnox, Pa., will leave shortly for England, where he will be identified with Blaw-Knox, Ltd., London. In his new capacity he will make a study of problems relating to open-hearth equipment and other steel plant specialties. Mr. Hays was graduated from Harvard University in 1911, and before going with the Blaw-Knox company served as open-hearth superintendent at Edgar Thomson works, Carnegie Steel Co., Braddock, Pa. Previously he served in a similar capacity at the Carnegie company's Homestead works, and was also identified for a time with the Mingo, Ohio, works of the same company.

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S. CRAIG ALEXANDER, formerly engineer in the San Francisco sales department of the Ludlum Steel Co., has joined A. M. Castle & Co., as sales engineer in assisting to introduce in the San Francisco territory the Rezistal series of rustless products made by the Crucible Steel Co. of America, for which the Castle organization has been appointed warehouse distributer.

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V. C. LEFTWICH, of the American Smelting & Refining Co., New York, has resigned to become identified with the General Cable Corpn., 420 Lexington Avenue, New York. He has been assistant manager of copper and zinc sales for the past 10 years.

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## Wilson-Maeulen Co. and Foxboro Co. Merge Lines

The Wilson-Maeulen Co., Inc., 383 Concord Avenue, New York, will formally transfer its pyrometer business on Jan. 2 to become the Wilson-Maeulen Division, Foxboro Co., Foxboro, Mass. Manufacture of Rockwell hardness tester, a Wilson-Maeulen product, will be continued in the company's shop in New York, which will be operated under the new corporate title of Wilson Mechanical Instrument Co., Inc.

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Group meetings of gray iron foundrymen will be held at the Carteret Club, Jersey City, Dec. 17, and at the Manufacturers' Club, Philadelphia, Dec. 21. These meetings will be attended by Arthur J. Tuscany, manager of the Gray Iron Institute, who will outline the work of the institute in cost accounting, merchandising and technical service.

W. W. MACON
*Editor*

# ..THE IRON AGE..

A. I. FINDLEY
*Editor Emeritus*

(ESTABLISHED 1855)

## "If This Be Inflation"

TRANSFORMING a rout into an orderly retreat cannot be called an advance. Checking unbridled deflation to prevent it from leading to economic disaster cannot be called inflation. Yet President Hoover's moves to meet the country's financial crisis have been branded as inflationary. Deflation cannot be cured by inflation, we are told. Prices of goods and services must be permitted to seek their natural level.

It does not occur to the President's critics that what confronts us today is no "natural" recession of demand but rather a financial impasse, accompanied by a veritable stampede to sell. The credit base of our banking system has been greatly reduced by hoarding. The volume of paper eligible for rediscount has been cut down by diminished trade activity. Declining security prices have forced banks to sell out their customers, as well as to liquidate their own holdings of stocks and bonds. Everywhere there has been a race for liquidity—a policy necessary to protect the solvency of individual banks but injurious to the country at large, since it adds momentum to the vicious circle of deflation begetting deflation.

In this process, selling prices lose all reasonable relation to real values. United States Steel common is sold at $42, not because it isn't worth more, but because present conditions place a premium on cash. From a deflationist point of view, all will be well presumably, if our financial institutions—or at least most of them—succeed in weathering the storm. It matters little whether individual borrowers, after steadily whittling down their loans through many dreary months, are finally sold out and deprived of their equities, although still willing and able to continue interest payments. It is of little moment that home-owners face foreclosure because they cannot raise a few thousand to bring their mortgages into line with reduced valuations. The deflationists are hard-boiled. No mawkish sentimentalism for them! "Why heed the debtor's squawk?" they ask. "Let him take his medicine."

And yet when the debts of whole nations are involved the attitude of the deflationists undergoes a marked change. A debtor nation cannot be sold out. Hence we hear a great deal about adjusting debts in accordance with capacity to pay. It is remarkable indeed how much more solicitude is shown toward foreign debtors than toward our own citizens. Hard working, honest, reliable people—the best of risks—are summarily bereft of their property, not because they are not paying their debts to the extent of their capacity, but because they cannot meet abnormal demands.

Granted that lending institutions individually have no choice but to make such demands, common sense, if not deflationist economics, would indicate that it is high time to relieve them of that necessity. And in the present emergency the only possible source of remedial action is the Federal Government. This fact is fully appreciated by the President, as indicated in his annual message. The purpose of his proposals, in fine, is to rid our banking system of the panic policy which has encouraged hoarding, dried up credit, depressed values beyond all reason and needlessly impoverished many thousands of our worthiest citizens. To his critics President Hoover has every right to say, "If this be inflation, make the most of it."

## The Petroleum Producers

IN strong contrast with other commodities, the consumption of petroleum products in 1931 has declined to no more than a negligible extent. In one important branch, gasoline, there has even been some increase. It is therefore a matter of chagrin that the prices for the products have ruled so low and that many of the great companies have incurred such severe losses.

The losses have been ascribable largely to the writing down of inventories as prices have spiraled down. Recently there has been an improvement in the prices for both crude petroleum and gasoline, and there are some producers whose accounts for the last quarter of 1931 should figure better than previously.

The uncomfortable situation in petroleum has been ascribable to the excess of capacity in all branches and the rapacity of competing interests in seeking outlets for their products. The multiplicity of small refiners has been a disturbing factor and the racketeering of some of them, or their customers, in evading the state gasoline taxes has attained destructive proportions.

As remedies for the evils several measures have been under discussion, including a concerted effort to abolish racketeering, the imposition of a tariff on imported products, and the consolidation of interests with the objective of economy. The Socony-Vacuum consolidation has already been consummated and the Sinclair-Prairie is under consideration.

We think that we can discern, however, an im-

pending change for the better in an entirely different way. The greatest consumers of gasoline are the automobiles. Among the automobile manufacturers there is a strong tendency to equip them with engines of higher compression, for the purpose of giving more power. This is no new idea, but as one manufacturer institutes it and finds it a good selling feature others swiftly follow suit. The 1932 Chevrolet has just been announced with an engine of higher compression ratio and increased power without there being any increases in bore and stroke.

The high-compression engines require a higher grade of gasoline, the ordinary straight-run product being inadequate. The higher grade of gasoline must be free from heptane. Consequently the gasoline is now being classified by octane numbers. In addition to such higher grade of refining, superior qualities are imparted by the addition of lead tetra-ethyl.

Evidences of these changes are to be found in the statistics and quotations. On the Atlantic seaboard the price for bulk gasoline was recently raised 0.5c. a gallon, making the price for ordinary grade 6.5c. and for the super-refined grade 7c. Since 1927 the use of lead tetra-ethyl for the treatment of gasoline has been going up by leaps and bounds, and in 1930 about 12 per cent of the total production was so treated. This constitutes a new outlet for lead, which has already attained substantial proportions and promises to become larger.

The economic portent of these developments is clear. The gasoline business will be more and more diverted to the great refiners who have the equipment and knowledge to produce superior grades of product and will be correspondingly abstracted from refiners who produce just "gasoline" and often have to dispose of it under distressed conditions. Heretofore the rank and file of motorists have been ignorant of the differences among gasolines, but with an increasing vogue for high-compression engines in popular cars they will learn.

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## Remedies for Coal Trade Ills

TWO weeks ago a meeting of 50 bituminous coal operators in New York formulated a plan for helping their industry and since then the Bureau of Mines has issued its annual report showing number of mines and production by size classes for 1930. Thus there is late information of a comprehensive character as to how things have been going in coal.

One naturally sets the present situation against that existing in 1922 when so much public attention was directed to the soft coal industry. There was a great strike beginning April 1, 1922, with much unexpected striking in non-union fields, particularly the Connellsville region. The union won, largely on account of a breakdown in transportation of non-union coal from Kentucky, that in turn being largely due to a railroad strike of July 1.

It was then said that there were "too many mines and too many miners." Congress set up the United States Coal Commission, involving much expense and producing a voluminous report, about which nothing was done. The Cleveland agreement, which ended the 1922 strike, ran to April 1, 1923, whereupon the coal commission asked the union operators to sign for another year, pending completion of their report. Next came the three-year Jacksonville agreement.

The resulting idea of those times was to let economic forces apply the remedy. Last week's meeting shows what bad shape the industry is in, and the statistics just issued show in their own way that the number of mines has not been adequately reduced. Briefly the plan formulated last week involves regional consolidation of sales agencies, actual mergers where possible, an embargo on importation of all petroleum products and reduction of coal freight rates. The oil embargo must have been put in for good measure or for strategic reasons, as the oil industry would give support against the objections oil consumers would certainly raise in no mild way.

It has taken a great deal of trouble to put the coal men in frame of mind to hold such meetings and formulate such a plan. The economic forces thought of in 1922 and immediately following years have not worked. The smaller mines with the higher costs were to drop out, leaving a profitable business for the large mines. The number of small mines has had only a small decrease while the large mines have themselves been fighting to see who is to survive.

The statistics indicate in a general way that the trade has not been swinging from small mines to large mines in such manner as to bring about satisfactory results, but precise comparisons cannot be made, because in a lean year a large mine may have reduced output sufficiently to put it in a lower category. Thus in 1929 827 mines produced more than 200,000 tons each, while last year there were only 716 in that category. Some were closed, others dropped into the lower category of 100,000 to 200,000 tons, the number in that category decreasing from 660 to 608 by some mines dropping into a still lower category. The only gain was in very small mines, under 10,000 tons. These small mines are cooperative, more or less, with little overhead and flexible wage rates. The percentage of total production contributed by mines of 200,000 tons and over has risen merely from 47.2 per cent in 1923 to 63.1 per cent in 1930, the proportions of all other classes decreasing quite moderately. The economic remedy has had nine years in which to work and has certainly failed. Whether the operators have really become ready to face the facts and act accordingly may now perhaps be disclosed.

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## Casuals

THERE are many academic gentlemen who have complained in respect of profits in business and to whom the term profiteer has been the acme of reprehensibility. We have now nearly abolished profits but at the same time we have increased unemployment. There is growing a suspicion that profits may not be such a bad thing after all.

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Instead of the capitalistic system being doomed it seems to us that it is the socialistic that is being

scrapped. Great Britain tried it extensively, got into trouble, and is now withdrawing from it. Germany tried it even more extensively and thought it was a sedative until her creditors called a halt, and now it also is moving toward the right. There is certainly something in the lesson that the thrifty, hard-working and hard-headed French have been the most immune from economic disaster.

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## The Forging of Rustless Steel

(*Concluded from page* 1547)

door discharge type. Of brick and steel construction, each is 60 ft. long, 8 ft. wide, and about 6 ft. high. As these furnaces are heated with two gas burners each, located at the discharge end, the billets coming through from the other end receive a long preheat or soaking which equalizes the heat throughout the billet.

This is most necessary, otherwise the billet would tend to be soft and plastic in the outer section and contain a cooler, harder core, which condition would spoil the work during forging. These billets are in the furnace about 4 hr. The hearths of the furnaces are inclined, so that the round billets roll through by gravity. At the discharge end they are removed, through a small door in the side, by an operator with tongs suspended from an overhead track and chain hoist.

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## Electrical Instruments Uncover Hidden Shop Losses

(*Concluded from page* 1542)

its accompanying power factor investigation, while the second is the use of a recording instrument in time studies.

Peak loads frequently determine the cost of power. A graphic picture of an industrial plant peak load is given by the recording instrument. Analysis of this picture suggests staggering the schedule of large power-consuming tools instead of superimposing them and causing the high power peaks.

### Electrical Time Studies

The maintenance department finds portable instruments invaluable in "trouble shooting." Time studies need no longer require the presence of an attendant. The number of operations, the period of greatest production, in brief a complete time picture of a machine is automatically and accurately recorded on a chart. The accounting department can employ the irrefutable records of a graphic instrument taken on the battery of machine tools or even a major machine to determine their idle and active periods or improper use.

Such is a picture of the applications of electrical instruments in the machine tool field, sharply focussed on some details, very general in other respects. The reader should not infer from the preceding that electrical instruments are a panacea for machine tool ills. However, if the reader is convinced that these instruments have a definite application in the machine tool field and if he has been presented with one or two ideas which will be to his advantage, the objective is achieved.

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## Heating Refractories from "Cold" in Fuel-Fired Furnaces

(*Concluded from page* 1559)

2. The time required to heat up depends on the rate of firing and the final temperature required.

3. The time required for the same rate of firing and the same final temperature is practically independent of the wall construction and amount of insulation.

4. The amount of fuel required to heat a furnace to a given temperature in a given time is practically independent of the wall construction. For thin walls the radiation loss is greater, but the heat storage in the entire wall is less.

5. A variable rate of firing during heating up, with the highest rate at the start, is more efficient than a constant rate equal to the average of the variable rate.

6. The most efficient average rate of firing for the variable-rate method of heating up, expressed in B.t.u. liberated hourly in the furnace per sq. ft. of interior area of refractory lining, is about 10,000 to 12,000 B.t.u.

7. In some gas-fired furnaces the installation of gas burners, to be used when heating up only, will save time and fuel during heating-up periods.

8. With a knowledge of fuel rates most desirable when lighting, burners may be more intelligently selected for fuel-fired furnaces.

Part II of this article will deal with the experimental development of practical data on the heat flow in industrial furnace refractories after the furnace is heated up and during its operation, developing the comparative economy of furnaces (a) operated continuously and (b) operated for one 10-hr. period each day in a week.

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## Normalizing Automobile Sheet Steel

(*Concluded from page* 1543)

found to be the most favorable temperature for normalizing operations.

In discussing the paper, Thomas Dockray emphasized the view that normalizing is a term which needs clarification. He has found it applied to cooling in air from 1700 deg. F., which is above the critical point; he has also found it in use for a performance in which the metal is held in a cooling zone of the furnace until it has gone to 1300 deg. F., or below the critical point, and then allowed to cool in the air. We must settle, he said, upon a definite way to do this, or rather upon definite terms for these two different methods, so that we can distinguish between them.

# Steel Ingot Production at 25 Per Cent; Price Situation Awaits Clarification

## Retrenchment in Releases for December Delivery Affects Mill Schedules—Pig Iron Lower in Some Districts

STEEL plant operations are more markedly under the influence of inventory reductions, price weakness, and delays in the new manufacturing programs of the automobile companies.

Some of the smaller steel works have been shut down until the first week of January, and year-end idleness among general industrial companies is likely to be longer and more widespread than usual. Steel orders for immediate shipment have declined noticeably, but some business is being placed for January.

Ingot output for the entire country will average about 25 per cent of capacity this week, against 26½ per cent last week and 30 per cent in November. The decline is most marked in the Pittsburgh district, which is now on a 25 per cent basis; in the Valleys, which is not above 20 per cent, and in eastern Pennsylvania, where operations are even lower.

PRICE weakness affects both finished steel and pig iron. Concessions of $1 a ton on hot-rolled strip steel and $2 a ton or more on hot-rolled annealed sheets, and a definite decline of $1 a ton on cold-rolled strip to 2c. a lb., Pittsburgh or Cleveland, to the larger buyers imperil the efforts which mills have been making for some months toward a stabilized price structure on flat-rolled products. These signs of weakness follow recent reductions on automobile body sheets and a few other grades used largely by the automobile industry.

Foundry grades of pig iron have declined $1 a ton at Cleveland for local delivery, 50c. at Chicago and the same amount in the Valleys and at Pittsburgh, bringing THE IRON AGE composite price for pig iron down to $14.79, the lowest level since October, 1915, when the market was emerging from the slump of the early war period.

December recession in business indicates that both pig iron and steel ingot production will make new lows this month. Two Woodward furnaces in Alabama, together with ore and coal mines and coke plant, have been shut down, and the blast furnace at Hamilton, Ohio, has been banked.

WITH the new year only two weeks away, the steel trade is waiting for leadership in the formulation of price policies. Some announcements may be made this week. Except for the automobile industry, little interest has been shown by consumers in first quarter contracts, and most of the motor car manufacturers are still delaying final arrangements for the bulk of their tonnage. Contracts are expected this week from the Chevrolet, Chrysler and Buick companies, but Ford's buying has been repeatedly postponed and shipments of some minor orders have been suspended pending retooling for an eight-cylinder car to replace model A.

Production of the new car is not likely to get under way before Jan. 15, with the first public showing of the new models scheduled for February. In view of this program, Ford's first quarter steel contracts probably will not be placed for a week or 10 days.

Some automobile buying has developed. Chevrolet has bought steel for its gear and axle plants and sheets for the Fisher body plant in Cleveland. An Eastern manufacturer of automobile frames has inquired for 11,000 tons of heavy strip steel.

WHILE the steel industry is inclined to look for some improvement early in January, the dearth of important projects is disappointing. The building field offers little encouragement and prospects of railroad buying must remain indefinite until the pending wage question is settled.

Fabricated structural steel awards in the week were 16,600 tons, in addition to 7400 tons of sheet steel piling for dock construction in New York. Railroad buying is confined to a relatively small tonnage for repair work. The Chicago Great Western is requesting bids for the repair of 500 cars.

UNFILLED orders of the United States Steel Corpn., as of Dec. 1, amounting to 2,933,891 tons, are the lowest since 1910 and represent a loss of 185,541 tons during November against an average increase for that month from 1910 to 1930, inclusive, of 135,000 tons. This was the eighth consecutive monthly decline and reflects in part the absence of rail tonnage, which usually helps to swell the November bookings.

THE IRON AGE composite prices for finished steel and scrap are unchanged at 2.095c. a lb. for the former and $8.58 a ton for the latter.

# ▲▲▲ A Comparison of Prices ▲▲▲

**Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics**

## Pig Iron,

| *Per Gross Ton:* | Dec. 15, 1931 | Dec. 8, 1931 | Nov. 17, 1931 | Dec. 16, 1930 |
|---|---|---|---|---|
| No. 2 fdy., Philadelphia | $15.51 | $15.51 | $15.51 | $17.76 |
| No. 2, Valley furnace | *15.50* | 16.00 | 16.00 | 17.00 |
| No. 2 Southern, Cin'ti | 14.69 | 14.69 | 14.69 | 14.19 |
| No. 2, Birmingham | 12.00 | 12.00 | 12.00 | 14.00 |
| No. 2 foundry, Chicago* | *16.50* | 17.00 | 17.00 | 17.50 |
| Basic, del'd eastern Pa. | 16.25 | 16.25 | 16.25 | 17.75 |
| Basic, Valley furnace | 15.00 | 15.00 | 15.00 | 17.00 |
| Valley Bessemer, del'd P'gh. | *17.76* | 18.26 | 18.26 | 19.26 |
| Malleable, Chicago* | *16.50* | 17.00 | 17.00 | 17.50 |
| Malleable, Valley | *16.00* | 16.50 | 16.50 | 17.50 |
| L. S. charcoal, Chicago | 23.04 | 23.04 | 25.04 | 27.04 |
| Ferromanganese, scab'd carlots | †75.00 | †75.00 | †85.00 | 80.00 |

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

† Ferromanganese quotations adjusted to carload unit ; larger quantities at discount.

## Rails, Billets, etc.,

| *Per Gross Ton:* | | | | |
|---|---|---|---|---|
| Rails, heavy, at mill | $43.00 | $43.00 | $43.00 | $43.00 |
| Light rails at mill | 34.00 | 34.00 | 34.00 | 26.00 |
| Rerolling billets, Pittsburgh | 29.00 | 29.00 | 29.00 | 31.00 |
| Sheet bars, Pittsburgh | 29.00 | 29.00 | 29.00 | 31.00 |
| Slabs, Pittsburgh | 29.00 | 29.00 | 29.00 | 31.00 |
| Forging billets, Pittsburgh | 35.00 | 35.00 | 35.00 | 36.00 |
| Wire rods, Pittsburgh | 35.00 | 35.00 | 35.00 | 35.00 |
| | Cents | Cents | Cents | Cents |
| Skelp, grvd. steel, P'gh, lb. | *1.55* | 1.60 | 1.60 | 1.60 |

## Finished Steel,

| *Per Lb. to Large Buyers:* | Cents | Cents | Cents | Cents |
|---|---|---|---|---|
| Bars, Pittsburgh | 1.60 | 1.60 | 1.60 | 1.60 |
| Bars, Chicago | 1.60 | 1.60 | 1.70 | 1.70 |
| Bars, Cleveland | 1.65 | 1.65 | 1.65 | 1.65 |
| Bars, New York | 1.93 | 1.93 | 1.93 | 1.93 |
| Tank plates, Pittsburgh | 1.55 | 1.55 | 1.60 | 1.60 |
| Tank plates, Chicago | 1.60 | 1.60 | 1.70 | 1.70 |
| Tank plates, New York | 1.83 | 1.83 | 1.88 | 1.88 |
| Structural shapes, Pittsburgh | 1.50 | 1.50 | 1.60 | 1.60 |
| Structural shapes, Chicago | 1.60 | 1.60 | 1.70 | 1.70 |
| Structural shapes, New York | 1.80¼ | 1.80¼ | 1.85¼ | 1.85½ |
| Cold-finished bars, Pittsburgh | 2.10 | 2.10 | 2.10 | 2.00 |
| Hot-rolled strips, Pittsburgh | 1.50 | 1.50 | 1.50 | 1.55 |
| Cold-rolled strips, Pittsburgh | *2.00* | 2.05 | 2.05 | 2.25 |

## Finished Steel,

| *Per Lb. to Large Buyers:* | Dec. 15, 1931 Cents | Dec. 8, 1931 Cents | Nov. 17, 1931 Cents | Dec. 16, 1930 Cents |
|---|---|---|---|---|
| Hot-rolled annealed sheets, No. 24, Pittsburgh | 2.40 | 2.40 | 2.40 | 2.35 |
| Hot-rolled annealed sheets, No. 24, Chicago dist. mill | 2.50 | 2.50 | 2.50 | 2.45 |
| Sheets, galv., No. 24, P'gh | 2.90 | 2.90 | 2.90 | 2.90 |
| Sheets, galv., No. 24, Chicago dist. mill | 3.00 | 3.00 | 3.00 | 3.00 |
| Hot-rolled sheets, No. 10, P'gh. | *1.65* | 1.70 | 1.70 | ... |
| Hot-rolled sheets No. 10, Chicago dist. mill | *1.75* | 1.80 | 1.80 | ... |
| Wire nails, Pittsburgh | 1.90 | 1.90 | 1.90 | 1.90 |
| Wire nails, Chicago dist. mill | 1.95 | 1.95 | 1.95 | 1.95 |
| Plain wire, Pittsburgh | 2.20 | 2.20 | 2.20 | 2.20 |
| Plain wire, Chicago dist. mill | 2.25 | 2.25 | 2.25 | 2.25 |
| Barbed wire, galv., P'gh | 2.55 | 2.55 | 2.55 | 2.55 |
| Barbed wire, galv., Chicago dist. mill | 2.60 | 2.60 | 2.60 | 2.65 |
| Tin plate, 100 lb. box, P'gh | $4.75 | $4.75 | $4.75 | $5.00 |

## Old Material,

| *Per Gross Ton:* | | | | |
|---|---|---|---|---|
| Heavy melting steel, P'gh | $10.25 | $10.25 | $10.25 | $12.75 |
| Heavy melting steel, Phila | 7.75 | 7.75 | 8.00 | 11.00 |
| Heavy melting steel, Ch'go | 7.75 | 7.75 | 8.00 | 10.00 |
| Carwheels, Chicago | 8.50 | 8.50 | 8.50 | 11.75 |
| Carwheels, Philadelphia | 11.50 | 11.50 | 11.50 | 14.00 |
| No. 1 cast, Pittsburgh | 10.00 | 10.00 | 10.00 | 12.50 |
| No. 1 cast, Philadelphia | 10.00 | 10.00 | 10.50 | 12.00 |
| No. 1 cast, Ch'go (net ton) | 8.50 | 8.50 | 8.50 | 9.50 |
| No. 1 RR. wrot., Phila | 9.50 | 9.50 | 9.50 | 13.50 |
| No. 1 RR. wrot., Ch'go (net) | 6.50 | 6.50 | 6.50 | 8.50 |

## Coke, Connellsville,

| *Per Net Ton at Oven:* | | | | |
|---|---|---|---|---|
| Furnace coke, prompt | $2.40 | $2.40 | $2.40 | $2.50 |
| Foundry coke, prompt | 3.50 | 3.50 | 3.50 | 3.50 |

## Metals,

| *Per Lb. to Large Buyers:* | Cents | Cents | Cents | Cents |
|---|---|---|---|---|
| Lake copper, New York | 6.87½ | 6.87½ | 7.37½ | 10.62½ |
| Electrolytic copper, refinery | 6.25 | 6.25 | 6.75 | 9.75 |
| Tin (Straits), New York | **21.62½** | 20.65 | 23.25 | 23.75 |
| Zinc, East St. Louis | *3.15* | 3.17½ | 3.30 | 4.00 |
| Zinc, New York | *3.50* | 3.52½ | 3.65 | 4.35 |
| Lead, St. Louis | *3.55* | 3.65 | 3.90 | 4.95 |
| Lead, New York | *3.75* | 3.85 | 4.05 | 5.10 |
| Antimony (Asiatic), N. Y. | 6.25 | 6.25 | 6.75 | 7.10 |

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

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# ▲▲▲ The Iron Age Composite Prices ▲▲▲

| | Finished Steel | Pig Iron | Steel Scrap |
|---|---|---|---|
| Dec. 15, 1931 | 2.095c. a Lb. | $14.79 a Gross Ton | $8.58 a Gross Ton |
| One week ago | 2.095c. | 14.96 | 8.58 |
| One month ago | 2.116c. | 14.96 | 8.75 |
| One year ago | 2.121c. | 15.90 | 11.25 |
| | Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output. | Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham. | Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago. |

| | Finished Steel High | Finished Steel Low | Pig Iron High | Pig Iron Low | Steel Scrap High | Steel Scrap Low |
|---|---|---|---|---|---|---|
| 1931 | 2.142c., Jan. 13 | 2.095c., Dec. 8 | $15.90, Jan. 6 | $14.79, Dec. 15 | $11.33, Jan. 6 | $8.58, Dec. 8 |
| 1930 | 2.362c., Jan. 7 | 2.121c., Dec. 9 | 18.21, Jan. 7 | 15.90, Dec. 16 | 15.00, Feb. 18 | 11.25, Dec. 9 |
| 1929 | 2.412c., April 2 | 2.362c., Oct. 29 | 18.71, May 14 | 18.21, Dec. 17 | 17.58, Jan. 29 | 14.08, Dec. 3 |
| 1928 | 2.391c., Dec. 11 | 2.314c., Jan. 3 | 18.59, Nov. 27 | 17.04, July 24 | 16.50, Dec. 31 | 13.08, July 2 |
| 1927 | 2.453c., Jan. 4 | 2.293c., Oct. 25 | 19.71, Jan. 4 | 17.54, Nov. 1 | 15.25, Jan. 11 | 13.08, Nov. 22 |
| 1926 | 2.453c., Jan. 5 | 2.403c., May 18 | 21.54, Jan. 5 | 19.46, July 13 | 17.25, Jan. 5 | 14.00, June 1 |
| 1925 | 2.560c., Jan. 6 | 2.396c., Aug. 18 | 22.50, Jan. 13 | 18.96, July 7 | 20.83, Jan. 13 | 15.08, May 5 |

# Pittsburgh Steel Schedules Are Scaled Downward as Business Recedes

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**Ingot production in Pittsburgh district down to 25 per cent. Valley output also lower.**

* * *

**Orders for steel are mostly for shipment after Jan. 1.**

* * *

**A leading automobile manufacturer has suspended shipments on most of material it has on order.**

* * *

**Price uncertainties make situation somewhat complex. Few formal price announcements made.**

* * *

**Pig iron quotations lower. Scrap fairly steady, though demand is light.**

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PITTSBURGH, Dec. 15.—Although demand for finished steel products has not diminished materially in the last week, consumers are beginning to issue specifications for shipment after Jan 1, and rolling mill schedules are being scaled downward. Ingot production in the district is also lower, as several independent makers have already suspended production for the remainder of the year. The larger interests are maintaining output, but are adding to their stocks in so doing and may be expected to reduce output to a minimum in the next two weeks.

Operations in the Pittsburgh district this week average about 25 per cent of capacity and the rate in the Valleys has declined. The Wheeling district is unchanged. Finishing mill schedules have lost a few points from the previous week, although some mills are accumulating a little stock for the next two weeks and have improved their schedules.

The character of demand for steel products has changed very little, being confined almost entirely to the immediate needs of miscellaneous consumers. One of the large automobile companies which had been expected to increase its requirements during December has suspended shipments on most of the material it now has on order. The other consumers in Michigan are only making cars for dealers' stocks and their steel takings remain light. Prices on most products are weak. The failure of producers to name definite prices on first quarter business has made the situation more complex than usual. In most cases, steel makers are willing to make contracts for first quarter at present levels, but minimum figures are not clearly defined, particularly on sheets and strip steel. Producers of heavy hot-rolled products have not announced first quarter quotations but are expected to do so this week. Recent advances on wire products have not been tested.

Pig iron prices in Pittsburgh and the Valleys are 50c. a ton lower because of outside competition which is not always being met by local makers. Scrap quotations are holding their own, although transactions are few.

## Pig Iron

Many consumers of iron in this district are planning to suspend operations entirely in the last two weeks of the month, and most of them are taking no shipments this week. No new buying of importance is reported, and prices are not clearly defined on the carload lots which make up the bulk of current business. Offering prices of Lake Erie furnaces are so low both in the Valleys and at Pittsburgh that a general downward revision of prices has been made. While local furnaces have refused to meet competitive quotations in some cases, the fact that consumers are generally able to buy at concessions from the quoted market has made adherence to old prices impractical. No change is being made in basic iron, which continues nominal at $15, Valley, and $15.50, Pittsburgh furnace.

## Rails and Track Supplies

Scarcely any releases on rails or accessories are reaching local mills. No rail inquiry for 1932 has appeared, and apparently awaits clarification of wage negotiations between carriers and the unions. It is reported that considerable rail tonnage booked last year has not yet been released by the railroads, and that this is sufficient to supply their minimum needs during the winter.

## Bolts, Nuts and Rivets

Makers have opened their books for first quarter at present quotations, but are not pressing for business because of the weak price situation. Bolts and nuts are currently quoted at 70, 10 and 10 per cent off list; large rivets at $2.25 a 100 lb., and small rivets at 70, 10 and 5 off list. Few contracts are being closed and specifications are at the lowest rate of the year. Production averages about 20 per cent of capacity.

## Semi-Finished Steel

Sellers have made no announcement regarding first quarter prices as no inquiry has developed. However, they are willing to book contracts on the present basis of $29, Pittsburgh or Youngstown, on billets, slabs and sheet bars, and a few distress sales at lower levels are reported. Forging billets continue at $35, Pittsburgh. Consumers of wire rods will be given until Dec. 31 to specify against existing contracts at $35, Pittsburgh. The official price for first quarter, as previously announced, is $37, Pittsburgh or Cleveland.

## Bars, Plates and Shapes

Demand for these products has held up as well as could be expected during December, but is gradually easing off as year-end inventory taking approaches, and weather conditions prevent activity on outside jobs. The unusually open fall has enabled contractors to go ahead on many projects and led to heavier specifications than might have been expected. Most of the inquiry for structural steel and reinforcing bars which is coming out now will not be closed until January, and many projects announced previously have been postponed until after the first of the year. Bids were taken Dec. 15 on the superstructure of the Pittsburgh Post Office, requiring 15,000 tons of structural shapes. This is one of the largest jobs to be placed locally in more than two years. Demand for plates is very dull, with consumers, such as railroad car builders, barrel and tank fabricators and barge makers, generally dormant. The Chesapeake & Ohio is reported to have placed about 4000 tons of plates and shapes for car repairs with a Chicago district mill. Releases on merchant and alloy steel bars going to the automobile trade have failed to gain, and production continues at recent low levels.

While no announcement regarding first quarter prices has been made by local mills, it is reported that the actual asking price of 1.60c., Pitts-

burgh, will be reaffirmed. In spite of this, comparatively small consumers are able to buy shapes at 1.50c., Pittsburgh, and plates are rather freely available at 1.55c. Bar users continue to pay 1.60c. on the general run of business, and alloy bars are well maintained at 2.65c., Pittsburgh.

### Cold Finished Steel Bars

Most makers have now reaffirmed the present asking price of 2.10c., Pittsburgh, for first quarter contracting. This quotation still prevails on current small-lot purchases which make up the bulk of going business. While larger buyers have been getting material at 2c. for some time, it is pointed out that such a differential is not unusual in the industry. Releases in the past week have been very light, and current tonnage does not justify an operation of more than 20 per cent of capacity.

### Tubular Goods

With the exception of small gathering lines placed from time to time to supplement larger tonnages taken early in the year, the market on line pipe has become very quiet, and the prospect of further sizable awards this month is not very good. A number of lines are still under consideration, but are being delayed for one reason or the other, and will not likely reach company order books before early spring. Demand for standard pipe is seasonally quiet, as consumers are anxious to keep their stocks as low as possible over the year-end, and the same can be said of oil country goods, which are still influenced adversely by heavy distributers' stocks in the field. Mechanical tubing was a bit more active early in the month, but is again rather depressed. Scarcely any purchases of railroad tubular products are reported.

### Wire Products

Revised schedules announced recently on merchant wire products to take effect Jan. 1 have not yet been tested, but are reported to be meeting with little resistance in the trade. Buyers generally feel that if the market could be stabilized it would react to their benefit even though they might be forced to pay a premium on small lots. Not much fourth quarter tonnage is outstanding at the old price levels, and this is expected to be specified against before the end of the month in order to take advantage of the lower prices. On current business the price of nails is holding at $1.90 a keg, Pittsburgh, with $1.95 quoted on first quarter tonnage. Manufacturers' wire is well maintained at 2.20c., Pittsburgh.

### Sheets

Specifications were somewhat heavier with some companies last week, although much of the material on which releases are now coming in is for shipment after Jan. 1. As a result production has not changed much, and the industry is still engaged at 25 to 30 per cent of capacity. One or two makers are even running at a slightly better rate. Releases from the automobile industry are still rather light, as the larger consumers are not taking much material. Production this month has not gained as much as had been expected, and sheet makers are beginning to look for January tonnage. Miscellaneous consumers are expected to increase their needs rather substantially early in the new year, as many of them are closing down for a week or a fortnight and are letting stocks reach minimum requirements before that time.

First quarter contracting is proceeding rather slowly, largely because of the uncertain price situation. Large buyers who have issued inquiries are not pressing for quotations, and steel companies are just as cautious about making commitments. Barrel makers are reported to have had better prices on hot-rolled annealed sheets in this territory. Galvanized sheets are fairly well maintained in most of the important consuming centers, although price irregularity persists in the South.

### Tin Plate

Production has eased off a little, but is still maintained at slightly under 50 per cent for the industry as a whole. Two large producers are operating at from 95 to 100 per cent of capacity. Little talk of a price change is heard, and first quarter contracts have generally been negotiated.

### Strip Steel

Specifications are still light and call largely for small lots. Some tonnage for automobile makers which was to have been shipped this month has been held up, and the requirements of other motor car builders are still rather restricted.

### Coke and Coal

Demand for foundry coke is still declining and will be practically negligible in the last two weeks of the year. At this time foundry operations of the district will be suspended at most plants. Furnace coke is quiet, but a nearby producer has booked a contract from an Eastern blast furnace which will soon be blown in. No other furnace coke inquiry is before the trade, and none is expected in the near future in view of the few non-integrated pig iron making plants which are active. Domestic coke is being unfavorably affected by unseasonably warm weather, but a sudden turn will probably bring a marked shortage on the part of dealers.

### Old Material

With several of the open-hearth plants in the district already suspending production for the holiday period, the scrap market is very dull, although no further weakness in prices is apparent. Dealers are still paying $10 or more to cover old contracts on No. 1 heavy melting steel. Hydraulic compressed sheets have been sold into consumption at $10.25. With hold-ups at some of the usual consuming points, some distress scrap may be expected to appear in the next week or two. Minor changes in the other grades of old material are generally in the form of reduction, although a scarcity of some items is forcing buyers to raise their bidding prices.

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## St. Louis District Pig Iron, Steel and Scrap Users Are Marking Time Until the New Year

ST. LOUIS, Dec. 15.—The usual pre-Christmas dullness in the pig iron market seems to be intensified this year. No sizable first quarter tonnages have been placed by melters in the St. Louis industrial district. While the melt has been considerably reduced during the year, stocks in hands of melters have been kept low, and it is expected that the carryover will be extremely light. The market is firm at unchanged prices.

### Finished Steel

Open-hearth operations in the St. Louis district were reduced to about 10 per cent of capacity during the last week, when a furnace that had been in operation was down for repairs.

There were reports during the week that the price reduction of $2 a ton to 1.60c. a lb. on plates, shapes and bars, as made in Chicago on "attractive lots," had been met here on standard sections. Wide flange shapes are being held at 1.70c. Bookings during the last few weeks are said to be the lowest in years.

Railroads have indicated that they will issue inquiries within the next few days for their first quarter steel requirements. Buying against fourth quarter contracts has been the lightest in years.

### Old Material

Consumers will not reenter the market until after they have completed inventories, and dealers are buying only enough material to fill contracts, which are small. Very little material is coming in from the country districts. Railroad lists are small. The Missouri Pacific sold three lots totaling 22 carloads by telephone the past week. Other lists follow: Chesapeake & Ohio, 13,937 tons; New York, Chicago & St. Louis, 39 carloads, and Nashville, Chattanooga & St. Louis, 10 carloads. Prices are unchanged.

# Chicago Pig Iron Prices Decline 50c; Steel Buying Makes Poor Showing

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CHICAGO, Dec. 15.—Although the inventory period and the holiday have not yet had a marked effect on the local iron and steel market, their influence is being felt more as each day passes. New buying in finished steel is making a very poor showing and specifications barely measure up to the average in the previous three weeks, thereby halting the slow upward movement in demand.

Ingot output is declining, with the average at the moment close to 22 per cent of capacity.

Quotations on Northern foundry iron are off 50c. a ton in a market which is highly competitive because of the relatively small quantities that are being booked and the influence of odd lots of pig iron that are now available from sources other than local merchant producers.

In contrast with the price movement in pig iron, several Chicago reinforcing bar dealers are announcing new price cards that name 1.75c. a lb., base, on cars Chicago, for billet bar lots of 20 tons or more and 1.55c. a lb. for similar quantities of the rail steel product. A few contracts for cold-rolled strips have been entered at 2.05c. a lb., Cleveland, but forward buying of wire and wire products appears not to have been stimulated by announcements of prices for the first quarter.

Use of steel by the automobile industry is the brightest spot in the market. Farm implement builders are holding to schedules recently established. Car repair work appears somewhat more active, especially as the railroads are attempting to spread this work among a greater number of their shops and in this way afford additional employment along their lines.

As steel producers now view the near future, there will be no more than the normal shutdowns by them at the year-end, but the belief is general that the periods of idleness among general industrial plants may be longer and more widespread than has been the case in recent years.

### Pig Iron

Prices for Northern foundry iron are off 50c. to $16.50 a ton, local furnaces. The move in this direction was started several weeks ago, when prices were broken through by sales from a cargo of Lake Erie iron. Notwithstanding the close of navigation and the elimination of further threats from that source, there has been, and for that matter there still is, a tendency for sellers to feel around for what can actually be considered the true market level. New buying is less active, and there seems to be more reason now to believe that much of the iron that will move in the first quarter will be close-range sales. Shipments are holding well, considering the nearness of the year-end, and, with some users now taking more iron than in November, there is the prospect that larger use in some directions may come near balancing losses in other directions and thereby make December show up fairly well.

**Northern pig iron prices reduced 50c. a ton.**

* * *

**Steel demand influenced by approaching inventory and holiday period.**

* * *

**General industrial shutdowns at year-end expected to be longer and more widespread than usual.**

* * *

**Reinforcing bar distributors announce higher prices on both billet steel and rail steel material.**

* * *

**Scrap prices weak, with demand light and future of market still in doubt.**

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### Ferroalloys

This market is quiet except for sellers' activity in offering contracts on ferromanganese. Success in these efforts is fair.

### Bolts, Nuts and Rivets

Price structures for these commodities are weak as a result of extreme competition for the small amount of business that is available. A few orders from Western railroads are encouraging to the trade.

### Coke

Contracting for various periods from the first quarter to the full year is near an end, and prices remain well established at $7.50 a ton, local ovens. Shipments of by-product foundry coke are steady, though specifications are somewhat small, and it is expected that the movement will grow lighter between now and the first of the year.

### Wire Products

There exists only one bright spot in this market and that is a slightly heavier use of wire and wire products by manufacturers of automobiles. In most other directions consumption is lighter, though in the Southwest jobbers are doing a fairly active business considering the time of year. New buying is light and it is quite evident that recent announcements of first quarter prices have created little reaction in the minds of consumers. Shipments are again turning downward, the average so far in December being about on a par with the November movement, which was among the lowest in 1931. Copper wire and cable contracts from public utilities are still not in evidence, as this industry continues to purchase in small quantities for maintenance work only. Oil well drilling, where quantities of wire rope are used, is said to be off 70 per cent from the peak.

### Cold-Rolled Strip

Shipments to automobile manufacturers are turning up slightly. A few first quarter contracts have been entered on the basis of 2.05c. a lb., Cleveland. Output for the industry as a whole ranges from 15 to 20 per cent of capacity.

### Cast Iron Pipe

Outlook in this market is not promising beyond the fact that several moderate sized public projects appear to be taking shape. There is also some private work brewing, but the aggregate tonnage is so small compared with normal activity that little importance can be attached to it. Price structures remain weak, especially under conditions where a foundry desires to move a size that is in the yard. Hamilton, Ohio, has awarded 250 tons of 12-in. pipe to McWane Cast Iron Pipe Co., and Central Foundry Co. has taken 125 tons for Milan, Ind., and 5000 ft. of 6-in. pipe for Chester, Ill.

### Structural Material

Awards total close to 7000 tons and work pending is almost 8000 tons. These are rather impressive figures considering the times. However, it is of interest that practically all of

the tonnage is for public work, mostly bridges. The largest individual award is for a bridge at Peoria, Ill., and the largest inquiry, which is for 4100 tons, is for a viaduct on Mannheim Road at Justice Park, Ill. Figures have been taken on this viaduct at least three times, difficulty having been experienced at first when the Illinois wage law resulted in many public bids being thrown out. There is much speculation here as to the ultimate effect the new freight rates will have on fabricators west of Chicago. In general, rates from Chicago westward were increased, whereas rates were reduced on westbound movement from Pittsburgh.

### Reinforcing Bars

Bar dealers have announced advanced prices on both billet and rail steel bars. This action is being taken in the face of a dull market, which, after all, may be an advantage for the reason that not many old quotations are outstanding. State of Illinois will open bids Dec. 21 on 1000 tons of bars for highway bridge work. Open weather is still permitting shipments to bridge jobs in central and southern Illinois.

### Sheets

A slight increase in specifications is tending to iron out some of the scheduling difficulties that have been faced by producers. There is also a note of encouragement in interest shown in first quarter needs, a few contracts having been recently placed. Distribution by jobbers remains at a low level, but it is understood that some jobbers are now near the point of making commitments for the next three months.

### Rails and Track Supplies

Once again there is talk that several Western railroads are studying rail requirements. Producers are taking these reports as support for the hope expressed last fall that rail buying would develop in the spring on a fair scale. At the moment both inquiries of size and new buying are absent from the market. The Burlington, which, it had been reported, would come into the market for about 35,000 tons of rails, has as yet made no move.

### Plates

This market has turned very quiet except for the tonnage needed for current bridge work. Bids are soon due on 150 gondolas for the Northern Pacific, and the Chicago Great Western is asking for prices on materials for repairs to 500 freight cars. Western railroads are speeding work to more repair shops and are planning to take more steel.

### Bars

A gradually increasing movement of steel bars to automobile manufacturers and parts makers is the one high spot in this market. Use by farm equipment builders appears to have reached a level which may not be raised in the near future. Prospects for larg" use in railroad repair shops are brighter.

### Old Material

Prices continue to ease as consumer interest in immediate delivery lags. Users have refused offers of hydraulic bundles at $6.50 a ton, delivered. Axle turnings, No. 2 wrought and pipes and flues are off 25c. on recent sales. Freight car wrecking operations are decidedly lower, and incoming supplies of heavy melting steel are well matched with consumption. A little inquiry for scrap to be delivered next month has developed, but there is a question whether users are actually looking forward to making purchases or are trying to feel for the course of the market in the early part of the new year.

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## Pacific Coast Pipe Jobbers Advance Prices; October Steel Imports Again Large

SAN FRANCISCO, Dec. 14.—An advance of 10 per cent on out-of-stock prices on standard steel pipe has been announced by the warehouse trade, applying to all distributing centers on the Pacific Coast except Los Angeles.

On 10-ton lots, a 10 per cent discount is allowed from the new schedule. For many months small orders for pipe are said to have been handled at a loss or without profit, and the advance this month is indicative of a firming tendency among jobbers, which may be extended to other schedules later.

Although December volume suffers from the seasonal effects of inclement weather and delay until after inventory, both jobbers' and mill orders indicate that the trend is level or inclining upward, and that the low point was reached in August and September. Major projects for fabrication continue at a low level, and little change is expected this month.

Summaries of foreign steel tonnages imported on the Pacific Coast in October indicate an increase of 450 tons over those of the previous month for bars and shapes, with a total for the month of 2465 tons, or 20 per cent of the nation's imports. An additional 561 tons of nails and wire products was received.

### Finished Steel

Open awards of bars in the week were not over 400 tons, with approximately the same amount in new inquiries. About 800 tons of structural steel was awarded, with new projects for only 300 tons; 1000 tons of plates was placed under contract, and 850 tons is embraced in a new inquiry.

The Santa Fe Railroad is reported to have completed plans and arranged for local cooperation in a $250,000 viaduct at San Bernardino.

### Cast Iron Pipe

Signal Hill, Cal., will open bids Dec. 28 on 2100 tons of 18 and 20-in. Five hundred and fifty tons is involved in new projects at Waldport, Ore.; Burbank, Cal., and Pasco, Wash. Palo Alto, Cal., is planning a five-mile line involving 2, 4 and 6-in. pipe for specification early next year.

### Steel Pipe

It is reported that 75,000 tons of pipe for the oil industry is in idle stock in southern California. During the past six months there has been practically no drilling or new development, and declines and depreciation are causing concern to mills which have supplied this consigned tonnage.

### Rails

The City of Seattle will open bids Dec. 22 on 500 tons of rails for the municipal street railway.

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## Buffalo Market Dull; Some Scrap Bought

BUFFALO, Dec. 15.—Foundry operation in this district remains practically unchanged. Pig iron orders are dribbling in for car lots, but there is no real buying strength. Many foundries have notified producers that they will be in the market immediately after Dec. 31.

### Finished Steel

The Lackawanna plant of Bethlehem Steel continues to operate eight open-hearths; Republic Steel is operating three on its alternate week schedule; Wickwire Corpn. is operating two. Some fair-sized sheet tonnage has come out of Detroit and more is expected. A new warehouse and service building for the Westinghouse Electric & Manufacturing Co. will require 180 tons of fabricated structural steel.

### Old Material

The leading consumer has purchased another tonnage of No. 1 heavy melting steel and No. 2 heavy melting steel at $8.50 and $7 respectively. One lot was 1000 tons. Another consumer of No. 2 heavy melting steel has suspended shipment of scrap until after Jan. 1.

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Allis-Chalmers Mfg. Co., Milwaukee, has received a $1,000,000 order from the Pennsylvania Railroad.

# Cleveland Steel Business Is Lighter; Operations Steady

## Demands Are Mostly from the Automobile Industry, Though Not Large—Some Prices Weaken

CLEVELAND, Dec. 15.—Demand for finished steel in about all forms was lighter the past week than during the previous week or two. This was not unexpected in view of the approaching inventory period. However, steel plant operations are being maintained, local mills operating this week at 32 per cent of ingot capacity, or the same as last week.

While demand is mostly from the automotive field, orders from that source are not large. The heavy purchases expected to be made by the Ford Motor Co. have not yet materialized. Some fair tonnage in hot-rolled strip has come from cold rolling mills for making automobile lamps.

The outlook in the building field offers little encouragement. No business is coming from the railroads, and little is looked for until the wage question is settled.

More interest is being shown in first quarter prices on flat rolled steel. Efforts to advance hot-rolled strip $1 a ton for the first quarter have failed, as some of the mills have taken contracts for that delivery at the current prices of 1.50c., Pittsburgh, for wide and 1.60c., for narrow. Cold-rolled strip has declined to 2c., Cleveland, for large buyers and fender stock to 3c. Auto body sheets have settled to 3c., or a $2 a ton decline, and weakness is apparent on some other grades, particularly hot-rolled annealed sheets. Little interest is being shown in first quarter prices on bars, plates and shapes. While the belief is expressed that present prices will be maintained, formal price announcements have not yet been made by leading producers, although there has been some extension of contracts through the first quarter at 1.60c., Pittsburgh, for plates and shapes and 1.65c., Cleveland, for bars.

### Pig Iron

A $1 price reduction to $16, furnace, on foundry and malleable iron has been made by local producers for Cleveland delivery. The new price will apply to current orders and first quarter contracts. In view of the competitive situation that has brought out price concessions in outlying territory, the $17 asking price for local delivery had been regarded for several weeks as a nominal quotation. For outside shipment, $15 to $15.50 fairly represents the price range. Some of the foundries in the northern Ohio territory were able to buy iron fully as cheaply delivered as the Cleveland foundries from their own local source of supply so long as the $17 Cleveland price remained in effect, and there was also the possibility of outside iron coming into Cleveland. Concessions to $15.50 by Valley furnaces on foundry iron are reported. Buying during the week was in small lots and not much inquiry is looked for during the remainder of the year. A Cleveland foundry is inquiring for 2500 tons for the first quarter. Demand from the automobile foundries in the Michigan territory continues to be slow.

### Iron Ore

Ore on docks at Lake Erie ports Dec. 1 amounted to 6,048,327 tons. This is the smallest amount since 1904, although this has no particular significance in view of the fact that during recent years the greater percentage of ore has been going direct to the furnaces. Ore on docks Dec. 1, 1930, amounted to 6,466,326 tons. Lake Erie ports received 457,281 tons during November and 14,756,430 tons for the season. Shipments from these docks last month were 313,642 tons and for the season 11,013,286 tons. Chicago district and other ports outside of Lake Erie points received 8,476,707 tons during the season, against 14,337,329 tons last year.

### Sheets

Orders fell off somewhat the past week. Auto body sheets have definitely declined $2 a ton to 3c., Pittsburgh. While most of the producers are holding to 2.40c. for hot-rolled annealed sheets, some business has been placed by steel barrel manufacturers at 2.25c. Some of the barrel makers still have stocks purchased at that price before the last advance. Most of the mills have opened their books for the first quarter, but not many contracts have been placed.

### Bars, Plates and Shapes

Demand for these products has fallen off. In the construction field the Nine Mile Creek culvert job in Cleveland, requiring 2000 tons of reinforcing bars, has been placed. The steel will be supplied by a Cleveland mill. Several hundred tons of structural steel and reinforcing bars will be required for Ohio State highway bridge work, for which bids will be taken Dec. 18. The steel required for these jobs ranges mostly from 20 to 50 tons per bridge. No inquiry is pending in the building field. The trucks purchased from the White Co. by New York City will take about 1000 tons of plates for the frames and bodies. Steel bars are steady at 1.65c., Cleveland. Plates and shapes are generally maintained at 1.60c., Pittsburgh, on the small-lot orders that are being placed.

### Strip Steel

While a few small consumers have closed first quarter contracts at 1.55c. for wide and 1.65c. for narrow strip, or an advance of $1 a ton, larger consumers are holding out for the current prices, and one or more producers have yielded to the pressure of large consumers in the automotive field and made first quarter contracts at 1.50c. for wide and 1.60c. for narrow. Cold-rolled strip, recently held at 2.05c., Cleveland, is now quoted at 2c. to 2.05c. for contracts. For small lots 2.15c. is asked. Fender stock is down to 3c., a decline of $2 a ton. Shipping orders fell off the past week.

### Bolts and Nuts

The Ford Motor Co. during the week purchased a moderate tonnage of nuts and some bolts. This company makes most of its own bolts. Manufacturers have closed first quarter contracts with most of their trade at 73, 10 and 10 per cent discount. While the market is fairly steady, there have been some concessions to 80 per cent discount. The volume of business is about the same as in November.

### Old Material

Consumers have further curtailed shipments and very little scrap is expected to move during the remainder of the year. Only one mill in the Valley district is now taking scrap from local dealers and that only in blast furnace grades. With the outlet on blast furnace scrap limited to this one consumer, local prices have declined 75c. a ton on blast furnace scrap and 25c. a ton on machine shop turnings. These grades are now bringing $6.75 to $7 for Youngstown delivery.

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# Cincinnati Pig Iron Buying Steady but Low

CINCINNATI, Dec. 15.—Pig iron demand is holding to a level of approximately 1000 tons a week. No forward buying is reported. Southern furnaces received about one-third of the business placed the past week, all of which was in carload lots. The Hamilton, Ohio, furnace was banked last week. Northern foundry iron is still quoted at $17.90, delivered, Cincinnati. Sizable inquiries are lacking.

### Finished Steel

The sheet market is unchanged. Mills are operating at about 40 per cent of capacity. Except for a few small orders for January delivery, there is no movement to cover for first quarter.

### Old Material

Restrictions on shipments of scrap have retarded further the small movement against contracts. New business is small and infrequent.

# Eastern Pennsylvania Ingot Output Recedes Further

## Steel Users Show No Interest in Forward Buying—One Sheet Inquiry Calls for 11,000 Tons

PHILADELPHIA, Dec. 15.—With one steel plant operating only four open-hearth furnaces, a plate mill three and other eastern Pennsylvania producers one each, ingot output for the district does not average above 16 per cent of capacity, although rolling mill operations are at a slightly higher level.

Steel consumers show little interest in buying, being unable to foresee possible requirements in the first quarter. On small orders, which constitute most of the current business, prices are fairly well maintained, except for some shading on shapes, but lack of substantial tonnage business prevents any real test of price. The only active steel consumers are the automobile manufacturers and one radio company. The radio maker, however, has reduced operating schedules slightly in the past week.

One of the largest steel inquiries in this district for some months is a request for prices from the Parish Pressed Steel Co., Reading, Pa., on 11,000 tons of 20¼ x 81 in. material, 3/16 in. thick. Both strip and plate makers are bidding for the tonnage, which is for motor car chassis on a contract under consideration. Building projects are still individually small, but in the aggregate represent a fair tonnage of business for this season. Two small schools and an office building for Philadelphia have been placed, and small contracts have been awarded in the Baltimore district.

### Pig Iron

Most of the larger foundry iron users have covered nearby requirements with contracts extending into the first quarter, so that current buying is almost entirely of carloads, on which $15, eastern Pennsylvania furnace, usually applies. A Baltimore manufacturer has closed on about 2000 tons of No. 2 foundry iron with an eastern Pennsylvania steel company furnace. Southern iron is unchanged at $11 a ton, Birmingham, which puts it out of the running. Iron from India and Holland is being offered to eastern Pennsylvania users, and a small tonnage business in the Indian product continues. Other grades of pig iron are unchanged in price and generally inactive.

### Steel Bars

Buying is small, but the price is maintained at 1.60c. a lb., Pittsburgh, or 1.89c., Philadelphia. Billet steel reinforcing bars at 1.60c., Pittsburgh, or 1.89c., Philadelphia, are subject to concessions of $2 a ton and more on large projects.

### Plates and Shapes

Low bidder on a bridge contract at Curryville, Md., part of the Washington-New York electrification of the Pennsylvania Railroad, is the American Bridge Co. Included in this project are 388 tons of shapes, 164 tons of fabricated plates and 97 tons of floor plates. Fabricators of both shapes and plates are bidding on a number of small contracts, and some substantial business is in prospect for early next year, including a fabricated pipe line at Torresdale, Pa., a Post Office in Philadelphia, and an annex to the Congressional Library in Washington. Shape prices range from 1.60c. to 1.65c., f.o.b. nearest mill to consumer, or 1.64½c. to 1.69½c., Philadelphia. Plate quotations are 1.65c. to 1.70c., Coatesville, Pa., or 1.73½c. to 1.78½c., Philadelphia, the higher price applying only on miscellaneous lots of considerably under a carload.

### Sheets and Strip

An effort is being made to stabilize hot-rolled strip steel at a minimum of 1.55c., Pittsburgh, but on sizable business, such as a recent inquiry from an automobile parts maker, 1.50c. and lower are said by buyers to be obtainable. The galvanized sheet price is firmer at 2.90c., Pittsburgh, than it has been in recent weeks. If the automobile industry continues to improve, sellers expect some substantial tonnage from local manufacturers of bodies, chassis and parts. Meanwhile the radio makers are less active.

### Imports

In the week ended Dec. 12, arrivals at this port consisted of eight tons of steel tubing, of which four tons was from Germany and four tons from England, and one ton of iron sheets from Sweden.

### Old Material

Transactions in all grades of scrap are small. No. 1 steel is moving on contracts to Coatesville, Pa., and a small volume of No. 2 steel is being shipped to the consumer at Conshohocken, Pa. Recent offers of No. 2 steel at $6 a ton, delivered, have not been accepted by eastern Pennsylvania users. The Bethlehem, Pa., interest is not in the market for No. 1 and No. 2 steel, but has accepted carloads of No. 1 at $7 a ton, delivered, and recently bought a small tonnage of blast furnace scrap at $3.50 a ton, delivered, and about 600 tons of forge fire at $6.75, delivered. This consumer has recently intimated to scrap dealers that it may place its own barges in New York this winter to load No. 1 and No. 2 steel for Buffalo delivery in the spring. A broker, buying for this delivery, is loading barges in Brooklyn and New Jersey.

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# Many Birmingham Plants to Shut Down Longer Than Usual at Year End; Woodward Furnaces Go Out

BIRMINGHAM, Dec. 15.—The pig iron market is unimproved. Demand and shipments continue light. Many plants will close down earlier than usual for the Christmas holidays and will remain idle longer. Woodward Iron Co. will shut down completely today. All operations are to be stopped, including coal and ore mines, coke plant and furnace plant. Woodward has been operating two blast furnaces for some months. The blowing out of the Woodward furnaces will reduce the number of active stacks in Alabama to four, and these are on slow time. Prices for district deliveries remain firm on a $12 base.

### Cast Iron Pipe

American Cast Iron Pipe was awarded about 800 tons by Oakland, Cal., while National Cast Iron Pipe got 200 tons. It is expected that Pasadena will place around 1900 tons with United States Pipe & Foundry Co. Opening of bids on about 1000 tons by Long Beach, Cal., takes place this week. South Milwaukee opens new bids this week on 1000 tons. A small amount of business in carload lots continues to come in weekly. Pipe plants will probably have a longer holiday shutdown than customary. They will operate until a day or so before Christmas and then close until about the middle of January. Plant operations are about 30 per cent. Prices are based on $32 to $33, Birmingham.

### Finished Steel

Routine orders and inquiries continue to hold to a rather steady level. Demand is not active, but weekly volumes have been fair. Some first quarter wire business is pending. The Tennessee company operated five open-hearths at Fairfield last week. Gulf States Steel had its open-hearth plant idle, but this week has resumed with three furnaces.

### Old Material

There is practically no activity in the market. Shipments on contracts are very much reduced.

# New York Steel Buying Slow As Price Weakness Persists

## Only a Few Producers Have Taken Definite Stand for First Quarter—Plates, Shapes and Sheets Weak

NEW YORK, Dec. 15.—Steel buyers, although not particularly anxious to place first quarter contracts, are still without definite information in many instances as to what prices will be quoted for that period. Many of the steel company sales offices are without word from their home offices on forward contract prices, and are quoting for first quarter only when it appears necessary to do so. Buyers are aware of weak price tendencies in several directions and probably will wait for the situation to become clarified.

Plates are notably weak, although most of the transactions are too small to afford a real test. Current lots are being sold at 1.65c. to 1.70c., Coatesville, with 1.60c. available on attractive lots. Sales have been made at 1.50c., Coatesville. Structural shapes are obtainable at 1.60c., Eastern mills. Bars remain firm at 1.60c., Pittsburgh, and this may be the price for first quarter regardless of what is done as to plate and shape prices. Galvanized sheets are being offered by one mill for January shipment at 2.75c. and 2.80c., Pittsburgh, but other mills seem to be holding out for 2.90c. The sheet situation shows marked signs of weakness, but lack of large inquiries postpones the real test. New York and New Jersey are in the market for additional tonnages of sheets for automobile license plates.

Allen N. Spooner & Son, Inc., New York, has ordered 7400 tons of sheet steel piling for dock construction in New York from Bethlehem Steel Co. The city of Newark, N. J., has taken bids on 2000 ft. of 44-in. fabricated steel pipe. The New York Engineering Co., Yonkers, N. Y., is low bidder on a penstock in the Canal Zone, requiring 400 tons of plates. Fitzgibbons & Crisp, Inc., Trenton, N. J., is low bidder on bodies for White trucks for New York City, calling for about 800 tons of plates.

Much of the business booked by local steel sales offices in the past week was tin plate specifications for January shipment. The two leading can companies have not yet closed their 1932 contracts, but nearly all other tin plate users are covered.

### Pig Iron

No improvement in demand for pig iron is evident, with pending business comprised chiefly of small lots. About 3500 tons was sold in the past week, compared with 3000 tons the week before and 4500 tons two weeks ago. The Burnham Boiler Corpn., Irvington, N. Y., purchased a total of 1200 tons of No. 2 plain and No. 2X iron for first quarter shipment to its Elizabeth, N. J., and Lancaster, Pa., plants. This tonnage will be furnished by three eastern Pennsylvania furnaces. The American Locomotive Co. closed on 150 tons of silicon 3.25 to 3.75 for immediate shipment to its Schenectady, N. Y., works.

Foundry operations in northern New Jersey are estimated to be at 25 per cent of capacity, while operations in Brooklyn are at about 20 per cent of capacity.

Arrangements have just been concluded by the distributer of Royal Dutch iron for storing and handling this iron at Bridgeport, Conn., where a cargo of about 2500 tons will probably arrive late in January. As previously reported, a 5000-ton shipment of Royal Dutch iron is en route to Providence, R. I.

Prices are irregular, with frequent concessions being made on attractive tonnages.

### Cast Iron Pipe

Fresh inquiry for pressure pipe includes 500 tons of 16-in. for West Nyack, N. Y., 360 tons of 12-in. for Waltham, Mass., and 200 tons for an additional sewer project in Westchester County. Scarsdale, N. Y., awarded 400 tons of 24-in. to Warren Foundry & Pipe Corpn., and United States Pipe & Foundry Co. was low bidder on 160 tons of large-sized pipe for North Yonkers, N. Y.

### Reinforcing Bars

Prices on small lots are quotable at 1.60c., Pittsburgh, or 1.63c., delivered New York. On several sizable tonnages recently placed, however, concessions of $1 to $3 a ton have been made. New projects that will require bars include a sewer in East Orange, N. J., for which 500 tons is specified, and prison buildings at Sing Sing Prison, Ossining, N. Y., which will take about 260 tons. No outstanding awards were made in the past week.

### Old Material

A possible new feature of the scrap market in this district is barge loading in New York for shipment to Buffalo in the spring by the consuming interest at Bethlehem, Pa. At present, a broker in this district is storing No. 1 and No. 2 steel on barges for future shipment to Buffalo. In the event that the consumer enters this market as a buyer of these grades direct, it is intimated that there will be no change from the present $5.50 a ton price. No. 1 steel, in addition to being stored on barges, is quoted for eastern Pennsylvania delivery at $4 a ton and for Pittsburgh district shipment at $4.45 a ton, New York. The only delivery available for borings and other blast furnace material is to Pittsburgh, for which the highest offers are $6.75, delivered, or about $1.45, New York.

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# New England Pig Iron Sales at Low Ebb

BOSTON, Dec. 15.—Pig iron sales the past week were in scattered carlots, and did not exceed 500 tons in the aggregate. One New England firm is asking bids on 1000 tons of malleable iron for delivery outside New England, but there is no other prospective business in sellers' hands. Domestic furnaces are not attempting to meet quoted prices on Dutch iron; the latter is offered at $17.50 to $18 a ton, delivered, for any grade.

### Cast Iron Pipe

Augusta, Me., has placed 6000 ft. of 6-in. and 3000 ft. of 8-in. pipe with R. D. Wood & Co. That foundry also sold a small tonnage of 6-in. to Waltham, Mass. Shirley, Mass., bought a small tonnage from the Donaldson Iron Co., while some half dozen or so municipalities purchased an aggregate of more than 100 tons from the Warren Pipe Co. of Massachusetts, Inc. The Metropolitan District of Hartford County, Conn., will close bids Dec. 21 on 367 tons of 12-in. pit cast pipe and 8000 ft. 12-in. centrifugally cast Class 150. Waltham, Mass., will shortly place 9000 ft. of 12-in. pipe.

### Reinforcing Steel

Bookings for the week fell to a scant 200 tons, including 120 tons for a Worcester, Mass., auditorium taken by Joseph T. Ryerson & Son, Inc. Billet bars from stock are holding at 2.75c. a ton, base, for one to 5-ton lots and at 2.15c. for larger tonnages. Rail steel bars are about 2c. a lb., delivered Boston.

### Old Material

Business is still confined to scattered car lots of material, mostly No. 1 heavy melting steel and heavy cast for Pennsylvania delivery, and occasional purchases of small tonnages of textile and machinery cast from local or nearby yards by New England foundries. Prices are steady and unchanged.

## Reinforcing Steel

### Awards 3000 Tons—New Projects 2550 Tons

AWARDS

**Worcester, Mass.,** 120 tons, auditorium to Joseph T. Ryerson & Son, Inc.

**Elkton, Md.,** 625 tons, grade crossing elimination for Pennsylvania Railroad, to Concrete Steel Co.

**Cincinnati,** 140 tons, school, to West Virginia Steel Co., Huntington, W. Va.

**Cleveland,** 2000 tons, nine mile creek culverts, to Patterson Leitch Co.

**Los Angeles,** 100 tons, Virgil High School, to Emil Brown Co.

NEW REINFORCING BAR PROJECTS

**Waltham, Mass.,** 100 tons, State hospital unit.

**Black Rock, N. Y.,** unstated tonnage, grade elimination for New York Central Railroad; Walsh Construction Co., Syracuse, N. Y., general contractor.

**Valhalla, N. Y.,** 100 tons, New York Central Railroad grade crossing elimination.

**Ossining, N. Y.,** 260 tons, power house, knit shop and tunnels at Sing Sing Prison.

**New York,** 800 tons, West Side elevated highway, Twenty-second Street to Thirty-eighth Street; Poirier & McLane Corpn., New York, low bidder for general contract.

**Washington,** 140 tons, two Government incinerator plants; 100 tons, Rust Engineering Co., Pittsburgh, contractor; 40 tons, North-Eastern Construction Co., Baltimore, contractor.

**Washington,** 108 tons, naval research laboratory, Bellevue, Blackford Co., Greensboro, N. C., contractor.

**Biloxi, Miss.,** 565 tons, Federal Soldiers' Home; National Construction Co., Washington, low bidder.

**Cincinnati,** 115 tons, piers for Cincinnati Union Terminals Co.

**Springfield, Ill.,** 1200 tons, highway bridges.

**San Diego County, Cal.,** 300 tons, State highway structures.

**Los Angeles,** 363 tons, Wadsworth Veterans' Hospital.

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## Japan's Production Gains, Tariffs May Be Raised

WASHINGTON, Dec. 15.—Japanese iron and steel producers have announced production increases in several lines, averaging 10 per cent, following the action of the Japanese Government in embargoing gold exports. The Government, in going off the gold basis, prohibited outward movements of gold. According to Tokyo information received by the Department of Commerce from Commercial Attaché Halleck A. Butts, Japanese industry is reacting optimistically to the gold embargo and anticipates increased production and employment, larger exports and a small reduction in imports. The decline in imports apparently is predicated on the fact that depreciation of currency automatically acts as a tariff increase. Exports of iron and steel and metal-working machinery to Japan have been showing a decrease for some time, a fact which is also true of these shipments abroad generally.

The dispatch says that informed Japanese circles state that the tariff policy of the new cabinet is strongly protective and that if depreciated exchange does not curtail imports sufficiently, the Government may urge increased duties upon the Diet when it reassembles. Japanese observers state that it seems inevitable that the Diet will be dissolved on opening in January, followed by a general election, since the opposition party holds a majority in both houses. The Japanese information indicates the Seiyukai, or the new Government party, is committed to strengthen industry and will probably propose foreign and domestic bond issues.

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## A. S. T. M. Specifications for Railroad Castings

A decision to adhere to specifications on railroad steel castings, as adopted by the American Society for Testing Materials, was reached at a meeting of the Steel Founders' Society of America, held in Pittsburgh on Dec. 10. The society voiced opposition to changes in the tensile properties required for railroad castings, as proposed recently by the American Railway Association [THE IRON AGE, Oct. 29, page 1124], and adopted a report of a special committee, headed by A. F. Lorenz, Jr., director of purchases, American Steel Foundries, East Chicago, Ind., recommending such a policy.

The recommendation states that no member of the society will be obligated to refuse to manufacture materials according to combinations of physical properties other than those found in the American Society for Testing Materials or other nationally recognized specifications. However, foundries could reasonably ask for higher prices for specifications differing from the well known carbon grade material.

It was announced at the meeting that the society's cost committee has completed a uniform accounting and cost plan. A standard estimate form, based on a study of the forms in use by member companies, has also been arrived at by the cost committee and the society's cost engineer.

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The Statewide safety campaign launched by the Ohio Foundries Association Nov. 1 is showing good results, according to Robert Hoierman, secretary of the association. Fifty Ohio foundries reporting for November show a total of 6813 employees working a total of 539,605 man hours with only 11 accidents, all of minor character.

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Acme Steel Co., Chicago, has reduced the quarterly dividend on the common stock to 40c. from the rate of 50c. established last quarter. A recent announcement was to the effect that earnings of the company for 1931 were not expected to cover the year's dividends at the $2 rate.

## Canadian Railroads Expected to Buy

TORONTO, Dec. 15.—Orders for rails and rolling stock from the railroads are expected at an early date. Some branches of industry have improved. While there is a better undertone in the markets, there have been very few definite developments.

### Pig Iron

New business in this market fell off sharply in the past few days. Melters show no intention of placing contracts for first quarter. It is expected that most of them will adhere to present hand-to-mouth buying practice. It is understood that current quotations will hold to the end of the year at least, although in some instances there have been indications of shading.

### Old Material

Toronto and Montreal dealers report stagnant business. Steel scrap is moving very slowly. Prices are unchanged.

▲ ▲ ▲

## Pipe Lines

**City Council,** Hobart, Okla., will take bids soon for about 8½ miles of 14-in. cast iron or steel water pipe; also about 6000 ft. of 10-in. cast iron pipe. W. R. Holway, 302 East Eighteenth Street, Tulsa, Okla., engineer.

**Texas-Empire Pipe Line Co.,** Houston, Tex., will defer construction of 12-in. pipe line from Seminole County to east Texas oilfield district, recently noted.

**City Council,** Frederick, Md., contemplates purchase of quantity of 18-in. pipe for municipal water system.

**Stanolind Oil & Gas Co.,** Corsicana, Tex., is considering construction of oil pipe line from Corsicana-Mexia division to east Texas oilfields, about 17 miles.

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## Republic Sheet Mill at Niles, Ohio, to Resume

YOUNGSTOWN, Dec. 15.—Republic Steel Corpn. will resume operation Wednesday at eight of 18 sheet mills, which comprise its Niles plant. The units have been idle for the past 10 days. New orders this week on which early shipment is desired are responsible for the resumption.

▲ ▲ ▲

Marvel Carburetor Co., a division of Borg-Warner Corpn., reports November sales 30 per cent above those in October as a result of renewal of several blanket contracts with automobile manufacturers.

▲ ▲ ▲

Owensboro Forging Co., Owensboro, Ky., has applied to the Interstate Commerce Commission to establish the fourth class rate of 57c. per 100 lb. on drop forgings from Owensboro to Detroit and Dearborn, Mich.

# Metals Quiet as Inventory Approaches; Lead and Zinc Prices Reduced

NEW YORK, Dec. 15.—Domestic demand for electrolytic copper has been small in the past week, but the price is firm at 6.50c. a lb., delivered Connecticut Valley, and certain custom smelters are contemplating a minimum domestic price of 6.75c., delivered. Present firmness of price is attributed to current reports that changes in Copper Exporters, Inc., are being made successfully, a development which will make world limitation of output definitely effective. At 6.50c. a lb., delivered, certain custom smelters are not active sellers and are not fully disposing of intake.

Another factor in the present market is the possibility of action by Congress on a copper tariff; one proposed bill calls for a duty of 4c. a lb. The quotation of Copper Exporters, Inc., is unchanged at 7c. a lb., delivered usual European ports. So far this month, foreign buying has been smaller than previously, and the total, including Dec. 15, is about 5700 tons. Lake copper is quiet, and the price unchanged at 6.25c. for the lower grade, and 6.87½c., delivered, New York, for the better grade.

## Tin

Although the tin market in New York has advanced from 20.55c. a lb., on Dec. 9, to 21.62½c., on Dec. 15, the increase is entirely a result of upward movement in the pound sterling from $3.29 to $3.46. There have been no tin sales of any consequence in the past week. London prices today are £136 7s. 6d. for spot standard, £139 7s. 6d. for future standard, £139 2s. 6d. for spot Straits and £143 10s. from Singapore. Stocks in United Kingdom warehouses advanced 398 tons in the past week to 30,798 tons. Shipments of tin from Singapore to Dec. 12 total 2025 tons, which is at a rate slightly under the estimate of 5500 tons for the entire month.

## Lead

With demand at a low ebb, as inventory season approaches, producers reduced quotations $2 a ton on Dec. 14 in an effort to stimulate buying. The new price level of 3.75c., New York, and 3.55c., St. Louis, has brought out little new business, and not much is expected now until after Jan. 1. As only about one-third of January requirements are estimated to have been covered, improvement is expected early next month.

## Zinc

Although primary producers are maintaining 3.17½c., East St. Louis, and 3.52½c., New York, second hands are generally offering zinc at 2½ points lower price, or 3.15c., East St. Louis, and 3.50c., New York. Demand is small, with the year-end inventory approaching, but, as only a minor part of January requirements have been covered, renewed buying is expected early in the month.

## Antimony

The Chinese metal and the product of the domestic producer are at 6.25c., New York, with duty paid on the Chinese antimony. For future delivery, importers are asking from 6c. to 6.25c. a lb., duty paid, New York, the strength of future quotations being based on the upward trend of the silver price.

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## Armco Distributers Hold Convention

Sixty distributers attended the eighth annual convention of the Armco Distributers' Association in Middletown, Ohio, Dec. 10 and 11. Quincy W. Wales, Brown-Wales Co., Boston, president of the association, and A. J. Luedke, Milcor Steel Co., Milwaukee, vice-president, were reelected to their respective offices, and Bruce Haines, Hammond Sheet Metal Co., St. Louis, was elected secretary-treasurer.

Charles R. Hook, president, American Rolling Mill Co., presented his views on business conditions, stressing the importance of the automobile industry in providing business volume and employment. Bennett Chapple, vice-president of the company, cited the metal house as an outlet for large tonnages of sheets and stated that new developments in progress may revolutionize home construction methods.

### The Week's Prices. Cents Per Pound for Early Delivery

| | Dec. 15 | Dec. 14 | Dec. 12 | Dec. 11 | Dec. 10 | Dec. 9 |
|---|---|---|---|---|---|---|
| Lake copper, New York | 6.87½ | 6.87½ | 6.87½ | 6.87½ | 6.87½ | 6.87½ |
| Electrolytic copper, N. Y.* | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 |
| Straits tin, spot, N. Y. | 21.62½ | 21.55 | ... | 20.80 | 20.70 | 20.55 |
| Zinc, East St. Louis | 3.17½ | 3.15 | 3.15 | 3.15 | 3.15 | 3.15 |
| Zinc, New York | 3.52½ | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| Lead, St. Louis | 3.55 | 3.55 | 3.65 | 3.65 | 3.65 | 3.65 |
| Lead, New York | 3.75 | 3.75 | 3.85 | 3.85 | 3.85 | 3.85 |

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.
Aluminum, 98 to 99 per cent pure, 22.90c. a lb., delivered.
Nickel, electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 6.25c. a lb., New York.

### From New York Warehouse

*Delivered Prices, Base per Lb.*

| | |
|---|---|
| Tin, Straits pig | 23.25c. to 24.25c. |
| Tin, bar | 25.25c. to 27.25c. |
| Copper, Lake | 8.00c. to 9.00c. |
| Copper, electrolytic | 7.75c. to 8.75c. |
| Copper, casting | 7.50c. to 8.50c. |
| *Copper sheets, hot-rolled | 15.87½c. |
| *High brass sheets | 12.87½c. |
| *Seamless brass tubes | 16.12½c. |
| *Seamless copper tubes | 15.37½c. |
| *Brass rods | 10.62½c. |
| *Brazed brass tubes | 21.62½c. |
| Zinc, slab | 4.75c. to 5.25c. |
| Zinc sheets (No. 9), casks | 9.25c. to 9.50c. |
| Lead, American pig | 4.62½c. to 5.12½c. |
| Lead, bar | 6.37½c. to 7.37½c. |
| Lead sheets | 8.25c. |
| Antimony, Asiatic | 9.00c. to 10.00c. |
| Alum., virgin, 99 per cent plus | 23.30c. |
| Alum. No. 1 for remelting, 98 to 99 per cent | 17.00c. to 18.00c. |
| Solder, ½ and ½ | 15.25c. to 16.25c. |

*These prices are also for delivery from Chicago and Cleveland warehouses.

### Metals from Cleveland Warehouse

*Delivered Prices per Lb.*

| | |
|---|---|
| Tin, Straits pig | 25.50c. |
| Tin, bar | 27.50c. |
| Copper, Lake | 8.37½c. |
| Copper, electrolytic | 8.37½c. |
| Copper, casting | 8.00c. |
| Zinc, slab | 4.75c. to 5.00c. |
| Lead, American pig | 4.40c. to 4.65c. |
| Lead, bar | 7.75c. |
| Antimony, Asiatic | 10.00c. |
| Babbitt metal, medium grade | 15.00c. |
| Babbitt metal, high grade | 29.50c. |
| Solder, ½ and ½ | 18.50c. |

### Old Metals, Per Lb., New York

*Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)*

| | Dealers' Buying Prices | Dealers' Selling Prices |
|---|---|---|
| Copper, hvy. crucible | 5.25c. | 6.00c. |
| Copper, hvy. and wire | 5.00c. | 5.75c. |
| Copper, light and bottoms | 4.00c. | 4.75c. |
| Brass, heavy | 2.50c. | 3.25c. |
| Brass, light | 2.00c. | 2.75c. |
| Hvy. machine composition | 4.00c. | 4.75c. |
| No. 1 yel. brass turnings | 3.00c. | 3.50c. |
| No. 1 red brass or compos. turnings | 3.50c. | 4.25c. |
| Lead, heavy | 2.75c. | 3.125c. |
| Zinc | 1.25c. | 1.75c. |
| Sheet aluminum | 9.00c. | 11.00c. |
| Cast aluminum | 3.25c. | 5.00c. |

# ▲▲▲ Prices of Finished and Semi-Finished Steel,

## BARS, PLATES, SHAPES

### Iron and Steel Bars

*Soft Steel*

| | *Base per Lb.* |
|---|---|
| F.o.b. Pittsburgh mill | 1.60c. |
| F.o.b. Chicago | 1.60c. to 1.70c. |
| Del'd Philadelphia | 1.89c. |
| Del'd New York | 1.93c. |
| F.o.b. Cleveland | 1.65c. |
| F.o.b. Lackawanna | 1.70c. |
| F.o.b. Birmingham | 1.70c. |
| C.i.f. Pacific ports | 2.00c. |

*Billet Steel Reinforcing*

| | |
|---|---|
| F.o.b. P'gh mills, 40, 50, 60-ft. | 1.60c. |
| F.o.b. Birmingham, mill lengths | 1.75c. |
| F.o.b. Cleveland | 1.50c. |

*Rail Steel*

| | |
|---|---|
| F.o.b. mills, east of Chicago dist. | 1.30c. to 1.35c. |
| F.o.b. Chicago Heights mill | 1.50c. to 1.60c. |
| Del'd Philadelphia | 1.49c. to 1.59c. |

*Iron*

| | |
|---|---|
| Common iron, f.o.b. Chicago | 1.60c. to 1.70c. |
| Refined iron, f.o.b. P'gh mills | 2.75c. |
| Common iron, del'd Philadelphia | 2.09c. |
| Common iron, del'd New York | 2.14c. |

### Tank Plates

| | *Base per Lb.* |
|---|---|
| F.o.b. Pittsburgh mill | 1.55c. to 1.60c. |
| F.o.b. Chicago | 1.60c. to 1.70c. |
| F.o.b. Birmingham | 1.70c. |
| Del'd Cleveland | 1.78½c. |
| Del'd Philadelphia | 1.73½c. to 1.78½c. |
| F.o.b. Coatesville | 1.65c. to 1.70c. |
| F.o.b. Sparrows Point | 1.65c. to 1.70c. |
| F.o.b. Lackawanna | 1.65c. to 1.70c. |
| Del'd New York | 1.83c. to 1.88c. |
| C.i.f. Pacific ports | 1.80c. to 1.85c. |

### Structural Shapes

| | *Base per Lb.* |
|---|---|
| F.o.b. Pittsburgh mill | 1.50c. to 1.60c. |
| F.o.b. Chicago | 1.60c. to 1.70c. |
| F.o.b. Birmingham | 1.70c. |
| F.o.b. Lackawanna | 1.65c. to 1.70c. |
| F.o.b. Bethlehem | 1.65c. to 1.70c. |
| Del'd Cleveland | 1.68½c. to 1.78½c. |
| Del'd Philadelphia | 1.64½c. to 1.69½c. |
| Del'd New York | 1.80¼c. to 1.85¼c. |
| C.i.f. Pacific ports (standard) | 2.05c. |
| C.i.f. Pacific ports (wide flange) | 2.15c. |

### Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

| S.A.E. Series Numbers | | Alloy Differential per 100 Lb. |
|---|---|---|
| 2000 | (1½% Nickel) | $0.25 |
| 2100 | (1¼% Nickel) | 0.55 |
| 2300 | (3½% Nickel) | 1.50 |
| 2500 | (5% Nickel) | 2.25 |
| 3100 | Nickel Chromium | 0.55 |
| 3200 | Nickel Chromium | 1.35 |
| 3500 | Nickel Chromium | 3.80 |
| 3400 | Nickel Chromium | 3.20 |
| 4100 | Chromium Molybdenum (0.15 to 0.25 Molybdenum) | 0.50 |
| 4100 | Chromium Molybdenum (0.25 to 0.40 Molybdenum) | 0.70 |
| 4600 | Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel) | 1.05 |
| 5100 | Chromium Steel (0.60 to 0.90 Chromium) | *0.35 |
| 5100 | Chromium Steel (0.80 to 1.10 Chromium) | 0.45 |
| 5100 | Chromium Spring Steel | 0.20 |
| 6100 | Chromium Vanadium Bar | 1.20 |
| 6100 | Chromium Vanadium Spring Steel | 0.95 |
| 9250 | Silicon Manganese Spring Steel (flats) | 0.25 |
| | Rounds and squares | 0.50 |
| Chromium Nickel Vanadium | | 1.50 |
| Carbon Vanadium | | 0.95 |

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a section area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

### Cold-Finished Bars

| | *Base per Lb.* |
|---|---|
| Bars, f.o.b. Pittsburgh mill | 2.10c. |
| Bars, f.o.b. Chicago | 2.10c. |
| Bars, Cleveland | 2.00c. to 2.10c. |
| Bars, Buffalo | 2.10c. |
| Shafting, ground, f.o.b. mill | *2.45c. to 3.40c. |

## SHEETS, STRIP, TIN PLATE, TERNE PLATE

### Sheets

*Hot-Rolled*

| | *Base per Lb.* |
|---|---|
| No. 10, f.o.b. Pittsburgh | 1.65c. to 1.70c. |
| No. 10, f.o.b. Chicago mills | 1.75c. to 1.80c. |
| No. 10, del'd Philadelphia | 1.94c. to 1.99c. |
| No. 10, f.o.b. Birmingham | 1.85c. |
| No. 10, c.i.f. Pacific Coast ports | 2.33c. |

*Hot-Rolled and Annealed*

| | |
|---|---|
| No. 10, Pittsburgh | 1.85c. |
| No. 10, Chicago mills | 1.95c. |
| No. 10, Birmingham | 2.00c. |

*Hot-Rolled Annealed*

| | |
|---|---|
| No. 24, f.o.b. Pittsburgh | 2.40c. |
| No. 24, f.o.b. Chicago mills | 2.50c. |
| No. 24, del'd Philadelphia | 2.69c. |
| No. 24, f.o.b. Birmingham | 2.55c. |
| No. 24, c.i.f. Pacific Coast ports | 2.88c. |

*Heavy Cold-Rolled*

| | |
|---|---|
| No. 10 gage, f.o.b. Pittsburgh | 2.35c. |
| No. 10 gage, f.o.b. Chicago mills | 2.45c. |
| No. 10 gage, del'd Philadelphia | 2.64c. |

*Light Cold-Rolled*

| | |
|---|---|
| No. 20 gage, f.o.b. Pittsburgh | 2.85c. to 2.95c. |
| No. 20 gage, f.o.b. Chicago mills | 2.90c. to 3.05c. |
| No. 20 gage, del'd Philadelphia | 3.14c. to 3.24c. |

*Automobile Body Sheets*

| | |
|---|---|
| No. 20, f.o.b. Pittsburgh | 3.00c. |

*Steel Furniture Sheets*

| | |
|---|---|
| No. 10, f.o.b. Pittsburgh | 2.75c. |
| No. 20, f.o.b. Pittsburgh | 3.35c. |

(Prices on furniture stock include stretcher leveling but not resquaring.)

*Galvanized Sheets*

| | |
|---|---|
| No. 24, f.o.b. Pittsburgh | 2.90c. |
| No. 24, f.o.b. Chicago mills | 3.00c. |
| No. 24, del'd Philadelphia | 3.19c. |
| No. 24, f.o.b. Birmingham | 3.05c. |
| No. 24, c.i.f. Pacific Coast ports | 3.38c. |

*Long Ternes*

| | |
|---|---|
| No. 24, unassorted, 8-lb. coating, f.o.b. P'gh | 3.00c. to 3.10c. |

*Vitreous Enameling Stock*

| | |
|---|---|
| No. 10, f.o.b. Pittsburgh | 2.75c. |
| No. 20, f.o.b. Pittsburgh | 3.25c. |

*Tin Mill Black Plate*

| | |
|---|---|
| No. 28, f.o.b. Pittsburgh | 2.65c. |
| No. 28, Chicago mills | 2.75c. |

### Tin Plate

| | *Base per Box* |
|---|---|
| Standard cokes, f.o.b. P'gh district mills | $4.75 |
| Standard cokes, f.o.b. Gary | 4.85 |

### Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)

(Per Package, 20 x 28 in.)

| | |
|---|---|
| 8-lb. coating I.C. $9.50 | 25-lb. coating I.C. $14.10 |
| 15-lb. coating I.C. 12.00 | 30-lb. coating I.C. 14.90 |
| 20-lb. coating I.C. 13.00 | 40-lb. coating I.C. 16.70 |

### Hot-Rolled Hoops, Bands and Strips

| | *Base per Lb.* |
|---|---|
| 6 in. and narrower, Pittsburgh | 1.60c. |
| Wider than 6 in., P'gh | 1.50c. |
| 6 in. and narrower, Chicago | 1.70c. |
| Wider than 6 in., Chicago | 1.60c. |
| Cooperage stock, P'gh | 1.75c. to 1.85c. |
| Cooperage stock, Chicago | 1.85c. to 1.95c. |

### Cold-Rolled Strips

| | |
|---|---|
| F.o.b. P'gh | 2.00c. to 2.10c. |
| F.o.b. Cleveland | 2.00c. to 2.10c. |
| F.o.b. del'd Chicago | 2.33c. |
| F.o.b. Worcester | 2.20c. |
| Fender stock, No. 20 gage, Pittsburgh or Cleveland | 3.00c. |

*According to size.

## STEEL PIPE AND TUBING

### Welded Pipe

**Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills**

*Butt Weld*

| *Steel* Inches | Black | Galv. | *Iron* Inches | Black | Galv. |
|---|---|---|---|---|---|
| ⅛ | 47 | 21½ | ¼ and ⅜ | +11 | +36 |
| ¼ to ⅜ | 53 | 27½ | ½ | 23 | 5 |
| ½ | 58 | 44½ | ¾ | 28 | 11 |
| ¾ | 62 | 50½ | 1 and 1¼ | 31 | 15 |
| 1 to 3 | 64 | 52½ | 1½ and 2 | 35 | 18 |

*Lap Weld*

| | | | | | |
|---|---|---|---|---|---|
| 2 | 57 | 45½ | 2 | 23 | 9 |
| 2½ to 6 | 61 | 49½ | 2½ to 3½ | 28 | 13 |
| 7 and 8 | 58 | 45½ | 4 to 6 | 30 | 17 |
| 9 and 10 | 56 | 43½ | 7 and 8 | 29 | 16 |
| 11 and 12 | 55 | 42½ | 9 to 12 | 26 | 11 |

*Butt Weld, extra strong, plain ends*

| | | | | | |
|---|---|---|---|---|---|
| ⅛ | 43 | 26½ | ¼ and ⅜ | +13 | +48 |
| ¼ to ⅜ | 49 | 32½ | ½ | 23 | 7 |
| ½ | 55 | 44½ | ¾ | 28 | 12 |
| ¾ | 60 | 49⅛ | 1 to 2 | 34 | 18 |
| 1 to 1½ | 62 | 51½ | | | |
| 2 to 3 | 63 | 52½ | | | |

*Lap Welds, extra strong, plain ends*

| | | | | | |
|---|---|---|---|---|---|
| 2 | 55 | 44½ | 2 | 29 | 13 |
| 2½ to 4 | 59 | 48½ | 2½ to 4 | 34 | 20 |
| 4½ to 6 | 58 | 47½ | 4½ to 6 | 33 | 19 |
| 7 to 8 | 54 | 41½ | 7 and 8 | 31 | 17 |
| 9 and 10 | 47 | 34½ | 9 to 12 | 21 | 8 |
| 11 and 12 | 46 | 33½ | | | |

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discounts of 5 and 2½%, and on galvanized by 1¼ points with supplementary discounts of 5 and 2½%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

### Boiler Tubes

**Base Discounts, f.o.b. Pittsburgh**

| *Steel* | | *Charcoal Iron* | |
|---|---|---|---|
| 2 in. and 2¼ in. | 38 | 1½ in. | 1 |
| 2½ in.—2¾ in. | 46 | 1¾ in. | 8 |
| 3 in. | 52 | 2 in.—2¼ in. | 13 |
| 3¼ in.—3¾ in. | 54 | 2½ in.—2¾ in. | 16 |
| 4 in. | 57 | 3 in. | 17 |
| 4½ in. to 6 in. | 46 | 3¼ in. to 3½ in. | 18 |
| | | 4 in. | 20 |
| | | 4½ in. | 21 |

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

*Standard Commercial Seamless Boiler Tubes*

*Cold Drawn*

| | | | |
|---|---|---|---|
| 1 in. | 61 | 3 in. | 46 |
| 1¼ to 1½ in. | 53 | 3¼ to 3½ in. | 48 |
| 1¾ in. | 37 | 4 in. | 51 |
| 2 to 2¼ in. | 32 | 4½, 5 and 6 in. | 40 |
| 2½ to 2¾ in. | 40 | | |

*Hot Rolled*

| | | | |
|---|---|---|---|
| 2 and 2¼ in. | 38 | 3¼ to 3½ in. | 54 |
| 2½ and 2¾ in. | 46 | 4 in. | 57 |
| 3 in. | 52 | 4½, 5 and 6 in. | 46 |

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

### Seamless Mechanical Tubing

| | *Per Cent Off List* |
|---|---|
| Carbon, 0.10% to 0.30% base (carloads) | 55 |
| Carbon, 0.30% to 0.40% base | 50 |

Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

# Bolts, Nuts, Coke, Coal, Fuel Oil, Cast Iron Pipe ▲▲▲

## WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland)
(After Dec. 31, extras of 10c. a 100 lb. on mixed and joint carloads, 25c. on pool carloads and 40c. on less than carloads will be applied on all merchant wire products.)

*To Manufacturing Trade*

| | |
|---|---|
| Bright wire | 2.20c. |
| Spring wire | 3.20c. |

*To Jobbing Trade*

| | *Base per Keg* |
|---|---|
| Standard wire nails | $1.90 to $1.95 |
| Smooth coated nails | 1.90 to 1.95 |
| Galvanized nails | 3.90 |

| | *Base per Lb.* |
|---|---|
| Smooth annealed wire | 2.35c. |
| Smooth galvanized wire | 2.80c. |
| Polished staples | 2.35c. to 2.50c. |
| Galvanized staples | 2.60c. to 2.75c. |
| Barbed wire, galvanized | 2.55c. to 2.60c. |

| | |
|---|---|
| Woven wire fence, Nos. 9 and 11 gage, per net ton | $55.00 |
| Woven wire fence, No. 12½ gage and lighter, per net ton | 60.00 |

*Anderson, Ind., mill prices are ordinarily $1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.*

## RAILS AND TRACK SUPPLIES

### Rails

| | *Per Gross Ton* |
|---|---|
| Standard, f.o.b. mill | $43.00 |
| Light (from billets), f.o.b. mill | 34.00 |
| Light (from rail steel), f.o.b. mill | 32.00 |

### Track Equipment

| | *Base per 100 Lb.* |
|---|---|
| Spikes, ⅜-in. and larger | $2.70 |
| Spikes, ½-in. and larger | 2.70 |
| Spikes, boat and barge | 2.90 |
| Tie plate, steel | 1.85 |
| Angle bars | 2.75 |
| Track bolts, to steam railroads | $3.80 to 4.00 |
| Track bolts, to jobbers, all sizes, per 100 count | 73 per cent off list |

## BOLTS, NUTS RIVETS AND SET SCREWS

### Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

| | *Per Cent Off List* |
|---|---|
| †Machine bolts | 73, 10 and 10 |
| †Carriage bolts | 73, 10 and 10 |
| Lag bolts | 73, 10 and 10 |
| Plow bolts, Nos. 1, 2, 3 and 7 heads | 73, 10 and 10 |
| Hot-pressed nuts, blank or tapped, square | 73, 10 and 10 |
| Hot-pressed nuts, blank or tapped, hexagons | 73, 10 and 10 |
| C.p.c. and t. square or hex. nuts, blank or tapped | 73, 10 and 10 |
| Washers* | 7.00c. to 6.75c. per lb. off list |

*F.o.b. Chicago, New York and Pittsburgh.
†Bolts with rolled thread up to and including ⅝ in. x 6 in. take 10 per cent lower list prices.

### Bolts and Nuts

| | *Per Cent Off List* |
|---|---|
| Semi-finished hexagon nuts | 73, 10 and 10 |
| Semi-finished hexagon castellated nuts, S.A.E. | 73, 10 and 10 |
| Stove bolts in packages, P'gh | 80, 25 and 10 |
| Stove bolts in packages, Ch'go | 80, 25 and 10 |
| Stove bolts in pkgs., Cleveland | 80, 25 and 10 |
| Stove bolts in bulk, P'gh | 80, 25, 10 and 2½ |
| Stove bolts in bulk, Ch'go | 80, 25, 10 and 2½ |
| Stove bolts in bulk, Cleveland | 80, 25, 10 and 2½ |
| Tire bolts | 60, 10 and 10 |

Discounts of 73, 10 and 10 per cent off on bolts and nuts apply on carload business with jobbers and large consumers.

### Large Rivets

(½-in. and larger)

| | *Base per 100 Lb.* |
|---|---|
| F.o.b. Pittsburgh or Cleveland | $2.25 |
| F.o.b. Chicago | 2.35 |

### Small Rivets

(⅞-in. and smaller)

| | *Per Cent Off List* |
|---|---|
| F.o.b. Pittsburgh | 70, 10 and 5 |
| F.o.b. Cleveland | 70, 10 and 5 |
| F.o.b. Chicago | 70, 10 and 5 |

### Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

| | *Per Cent Off List* |
|---|---|
| Milled cap screws | 80, 10, 10 and 5 |
| Milled standard set screws, case hardened | 80 and 5 |
| Milled headless set screws, cut thread | 75 and 10 |
| Upset hex. head cap screws, U.S.S.S. thread | 85 and 10 |
| Upset hex. cap screws, S.A.E. thread | 85 and 10 |
| Upset set screws | 80, 10 and 5 |
| Milled studs | 70 |

## SEMI-FINISHED STEEL

### Billets and Blooms

| | *Per Gross Ton* |
|---|---|
| Rerolling, 4-in. and under 10-in., Pittsburgh | $29.00 |
| Rerolling, 4-in. and under 10-in., Youngstown | 29.00 |
| Rerolling, 4-in. and under 10-in., Cleveland | 29.00 |
| Rerolling, 4-in. and under 10-in., Chicago | 31.00 |
| Forging quality, Pittsburgh | 35.00 |

### Sheet Bars

(Open-Hearth or Bessemer)

| | *Per Gross Ton* |
|---|---|
| Pittsburgh | $29.00 |
| Youngstown | 29.00 |
| Cleveland | 29.00 |

### Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

| | *Per Gross Ton* |
|---|---|
| Pittsburgh | $29.00 |
| Youngstown | 29.00 |
| Cleveland | 29.00 |

### Skelp

(F.o.b. Pittsburgh or Youngstown)

| | *Per Lb.* |
|---|---|
| Grooved | 1.55c. to 1.60c. |
| Universal | 1.55c. to 1.60c. |
| Sheared | 1.55c. to 1.60c. |

### Wire Rods

(Common soft, base)

| | *Per Gross Ton* |
|---|---|
| Pittsburgh | $35.00 to $37.00 |
| Cleveland | 35.00 to 37.00 |
| Chicago | 36.00 to 38.00 |

## COKE, COAL AND FUEL OIL

### Coke

| | *Per Net Ton* |
|---|---|
| Furnace, f.o.b. Connellsville prompt | $2.40 |
| Foundry, f.o.b. Connellsville prompt | $3.25 to 4.50 |
| Foundry, by-product, Ch'go ovens | 7.50 |
| Foundry, by-product, New England, del'd | 10.50 |
| Foundry, by-product, Newark or Jersey City, delivered | 8.70 to 9.10 |
| Foundry, by-product, Phila. | $9.00 |
| Foundry, Birmingham | 5.00 |
| Foundry, by-product, St. Louis, f.o.b. ovens | 8.00 |
| Foundry, by-product, del'd St. Louis | 9.00 |

### Coal

| | *Per Net Ton* |
|---|---|
| Mine run steam coal, f.o.b. W. Pa. mines | $1.40 to $1.50 |
| Mine run coking coal, f.o.b. W. Pa. | 1.50 to 1.60 |
| Gas coal, ¾-in., f.o.b. Pa. mines | $1.70 to $1.80 |
| Mine run gas coal, f.o.b. Pa. mines | 1.50 to 1.60 |
| Steam slack, f.o.b. W. Pa. mines | 0.50 to 0.60 |
| Gas slack, f.o.b. W. Pa. mines | 0.65 to 0.75 |

### Fuel Oil

| | *Per Gal. f.o.b. Bayonne, N. J.* |
|---|---|
| No. 3 distillate | 3.50c. |
| No. 4 industrial | 3.00c. |
| | *Per Gal. f.o.b. Baltimore* |
| No. 3 distillate | 3.50c. |
| No. 4 industrial | 3.25c. |

## FLUXES AND REFRACTORIES

### Fluorspar

| | *Per Net Ton* |
|---|---|
| Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines | $13.00 |
| No. 2 lump, Illinois and Kentucky mines | 17.00 |
| Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid | 17.00 |
| Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines | 32.00 |

### Chrome Brick

| | *Per Net Ton* |
|---|---|
| Standard size | $45.00 |

### Fire Clay Brick

| | *Per 1000 f.o.b. Works* | |
|---|---|---|
| | High-Heat Duty Brick | Intermediate Heavy Duty Brick |
| Pennsylvania | $40.00 | $32.00 to $35.00 |
| Maryland | 40.00 | 32.00 to 35.00 |
| New Jersey | $44.00 to 59.00 | ..... |
| Ohio | 40.00 | 32.00 to 35.00 |
| Kentucky | 40.00 | 32.00 to 35.00 |
| Missouri | 37.00 | 32.00 to 35.00 |
| Illinois | 40.00 | 32.00 to 35.00 |
| Ground fire clay, per ton | 6.50 | |

### Silica Brick

| | *Per 1000 f.o.b. Works* |
|---|---|
| Pennsylvania | $40.00 |
| Chicago | 49.00 |
| Birmingham | 50.00 |
| Silica clay, per ton | 8.00 |

### Magnesite Brick

| | *Per Net Ton* |
|---|---|
| Standard sizes, f.o.b. Baltimore and Chester, Pa. | $65.00 |
| Grain magnesite, f.o.b. Baltimore and Chester, Pa. | 40.00 |

## CAST IRON PIPE

| | *Per Net Ton* |
|---|---|
| 6-in. and larger, del'd Chicago | $40.00 to $42.00 |
| 4-in., del'd Chicago | 43.00 to 45.00 |
| 6-in. and larger, del'd New York | $32.90 |
| 4-in., del'd New York | 35.90 |
| 6-in. and larger, Birmingham | $32.00 to 33.00 |
| 4-in., Birmingham | $35.00 to $36.00 |

Class "A" and gas pipe, $3 extra.

# Pig Iron Prices for All Districts

## VALLEY

**Per gross ton, f.o.b. Valley furnace:**

| | |
|---|---|
| Basic | $15.00 |
| Bessemer | $16.00 to 16.50 |
| Gray forge | 15.50 to 16.00 |
| No. 2 foundry | 15.50 to 16.00 |
| No. 3 foundry | 15.00 to 15.50 |
| Malleable | 16.00 to 16.50 |
| Low phos., copper free | 26.66 to 27.00 |

Freight rate to Pittsburgh or Cleveland district, $1.76.

## PITTSBURGH

**Per gross ton, f.o.b. Pittsburgh district furnace:**

| | |
|---|---|
| Basic | $15.50 |
| No. 2 foundry | $16.50 to 17.00 |
| No. 3 foundry | 16.00 to 16.50 |
| Malleable | 16.50 to 17.00 |
| Bessemer | 16.50 to 17.00 |

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

## CHICAGO

**Per gross ton at Chicago furnace:**

| | |
|---|---|
| N'th'n No. 2 fdy. | $16.50 |
| N'th'n No. 1 fdy. | 17.00 |
| Malleable, not over 2.25 sil. | 16.50 |
| High phosphorus | 16.50 |
| Lake Super. charcoal, sil. 1.50 | $23.04 to 25.04 |
| S'th'n No. 2 fdy. | 17.01 |
| Low phos., sil. 1 to 2, copper free | 28.50 to 29.20 |
| Silvery, sil. 8 per cent | 24.79 |
| Bess. ferrosilicon, 14-15% | 31.29 |

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnaces, not including an average switching charge of 61c. per gross ton.

## ST. LOUIS

**Per gross ton at St. Louis:**

| | |
|---|---|
| No. 2 fdy., sil. 1.75 to 2.25 f.o.b. Granite City, Ill. | $17.50 |
| Malleable, f.o.b. Granite City | 17.50 |
| N'th'n No. 2 fdy., del'd St. Louis | 18.66 |
| Southern No. 2 fdy., deliv'd | 15.42 |
| Northern malleable, deliv'd | 18.66 |
| Northern basic, deliv'd | 18.66 |

Freight rates 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

## NEW YORK

**Per gross ton, delivered New York district:**

| | |
|---|---|
| *Buffalo, No. 2, del'd east, N. J. | $17.78 to $18.28 |
| East. Pa. No. 2 fdy. | 16.89 to 17.39 |
| East. Pa. No. 2X fdy. | 17.89 to 18.39 |

Freight rates: $1.39 to $2.52 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

## BUFFALO

**Per gross ton, f.o.b. furnace:**

| | |
|---|---|
| No. 2 fdy. | $17.00 |
| No. 2X fdy. | 17.50 |
| No. 1 fdy. | 18.50 |
| Malleable, sil. up to 2.25 | 17.50 |
| Basic | 17.00 |
| Lake Superior charcoal | 25.28 |

## NEW ENGLAND

**Per gross ton delivered to most New England points:**

| | |
|---|---|
| *Buffalo, sil. 1.75 to 2.25 | $19.91 |
| *Buffalo, sil. 2.25 to 2.75 | 19.91 |
| *Ala., sil. 1.75 to 2.25 | $20.11 to 20.61 |
| *Ala., sil. 2.25 to 2.75 | 20.61 to 21.11 |
| †Ala., sil. 1.75 to 2.25 | 16.75 |
| †Ala., sil. 2.25 to 2.75 | 17.25 |

Freight rates: $4.91 all rail and $4.28 rail and water from Buffalo; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

## CINCINNATI

**Per gross ton, delivered Cincinnati:**

| | |
|---|---|
| Ala. fdy., sil. 1.75 to 2.25 | $14.69 |
| Ala. fdy., sil. 2.25 to 2.75 | 15.19 |
| Tenn. fdy., sil. 1.75 to 2.25 | 14.69 |
| N'th'n No. 2 foundry | 17.90 |
| S'th'n Ohio silvery, 8 per cent | 21.89 |

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

## PHILADELPHIA

**Per gross ton at Philadelphia:**

| | |
|---|---|
| East. Pa. No. 2 | $15.51 to $16.01 |
| East. Pa. No. 2X | 16.01 to 16.51 |
| East. Pa. No. 1X | 16.51 to 17.01 |
| Basic (del'd east. Pa.) | 16.25 |
| Malleable | 18.50 to 19.00 |
| Stand. low phos. (f.o.b. east. Pa. furnace) | 22.00 to 22.50 |
| Cop. b'r'g low phos. (f.o.b. furnace) | 22.00 to 23.50 |
| Va. No. 2 plain | 22.04 |
| Va. No. 2X | 22.54 |

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

## CLEVELAND

**Per gross ton at Cleveland furnace:**

| | |
|---|---|
| N'th'n No. 2 fdy. (local delivery) | $18.00 |
| S'th'n fdy., sil. 1.75 to 2.25 | 17.01 |
| Malleable (local delivery) | 18.00 |
| Ohio silvery, 8 per cent | 23.00 |
| Stand. low phos., Valley | 27.00 |

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; $3 from Jackson, Ohio; $6.01 from Birmingham.

## BIRMINGHAM

**Per gross ton, f.o.b. Birmingham dist. furnaces:**

| | |
|---|---|
| No. 2 fdy., 1.75 to 2.25 sil. | $12.00 |
| No. 1 fdy., 2.25 to 2.75 sil. | 12.50 |
| Basic | 12.00 |

## CANADA

**Per gross ton:**

Delivered Toronto

| | |
|---|---|
| No. 1 fdy., sil. 2.25 to 2.75 | $22.60 |
| No. 2 fdy., sil. 1.75 to 2.25 | 22.10 |
| Malleable | 22.60 |

Delivered Montreal

| | |
|---|---|
| No. 1 fdy., sil. 2.25 to 2.75 | $24.00 |
| No. 2 fdy., sil. 1.75 to 2.25 | 23.50 |
| Malleable | 24.00 |
| Basic | $23.00 to 23.50 |

# Prices of Ores and Ferroalloys

## Ores

*Lake Superior Ores, Delivered Lower Lake Ports*

| | *Per Gross Ton* |
|---|---|
| Old range Bessemer, 51.50% iron | $4.80 |
| Old range non-Bessemer, 51.50% iron | 4.65 |
| Mesabi Bessemer, 51.50% iron | 4.65 |
| Mesabi non-Bessemer, 51.50% iron | 4.50 |
| High phosphorus, 51.50% iron | 4.40 |

*Foreign Ore, c.i.f. Philadelphia or Baltimore*

| | *Per Unit* |
|---|---|
| Iron, low phos., copper free, 55 to 58% iron, dry, Spanish or Algerian | 8c. to 8.50c. |
| Iron, low phos., Swedish, aver. 68% iron | 9.00c. |
| Iron, basic or foundry, Swedish, average 65% iron | 8.00c. |
| Iron, basic and foundry, Russian, aver. 63% iron (nom.) | 9.00c. |
| Manganese, Caucasian, washed 52% | 24.00c. |
| Manganese, African, Indian, 50-52% | 23c. to 24c. |
| Manganese, Brazilian, 46 to 48% | 22c. to 23c. |
| Tungsten, Chinese wolframite | $11.00 to $11.25 |
| Tungsten, domestic scheelite | 9.50 to 10.00 |

| | *Per Gross Ton* |
|---|---|
| Chrome, 45% $Cr_2O_3$ crude, c.i.f. Atlantic seaboard | $18.00 |
| Chrome, 48% $Cr_2O_3$, c.i.f. Atlantic seaboard | 20.00 |

## Ferromanganese

| | *Per Gross Ton* |
|---|---|
| Domestic, 80%, seaboard | *$72.00 to $75.00 |
| Foreign, 80%, Atlantic or Gulf port, duty paid | *72.00 to 75.00 |

*Minimum price quoted for lots of 2000 tons or more.

## Spiegeleisen

| | *Per Gross Ton Furnace* |
|---|---|
| Domestic, 19 to 21% | $26.00 to $27.00 |

## Electric Ferrosilicon

| | *Per Gross Ton Delivered* |
|---|---|
| 50% (carloads) | $77.50 |
| 50% (less carload) | 85.00 |
| 75% | 126.00 |

| *Per Gross Ton Furnace* | | *Per Gross Ton Furnace* | |
|---|---|---|---|
| 10% | $35.00 | 12% | $39.00 |
| 11% | 37.00 | 14 to 16% | 31.00 |

## Bessemer Ferrosilicon

**F.o.b. Jackson County, Ohio, Furnace**

| *Per Gross Ton* | | *Per Gross Ton* | |
|---|---|---|---|
| 10% | $22.00 | 13% | $24.50 |
| 11% | 22.50 | 14% | 26.50 |
| 12% | 23.50 | 15% | 28.50 |

## Silvery Iron

**F.o.b. Jackson County, Ohio, Furnace**

| *Per Gross Ton* | | *Per Gross Ton* | |
|---|---|---|---|
| 6% | $19.00 | 11% | $21.50 |
| 7% | 19.50 | 12% | 22.50 |
| 8% | 20.00 | 13% | 23.50 |
| 9% | 20.50 | 14% | 25.50 |
| 10% | 21.00 | 15% | 27.50 |

## Other Ferroalloys

| | |
|---|---|
| Ferrotungsten, per lb. wo. del., carloads | $1.88 |
| Ferrotungsten, less carloads | $1.15 to 1.25 |
| Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads | 10.00c. |
| Ferrochromium, 2% carbon | 17.00c. to 17.50c. |
| Ferrochromium, 1% carbon | 19.00c. to 20.00c. |
| Ferrochromium, 0.10% carbon | 23.50c. to 25.00c. |
| Ferrochromium, 0.06% carbon | 25.50c. to 27.00c. |
| Ferrovanadium, del., per lb. contained Va. | $3.05 to $3.30 |
| Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads | 160.00 |
| Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base per gross ton | 91.00 |
| Ferromolybdenum, per lb. Mo., del. | 1.00 |
| Calcium molybdate, per lb. Mo., del. | 85c. |
| Ferrophosphorus, electric, 24%, f.o.b. Anniston, Ala., per gross ton | $122.50 |
| Silico spiegel, per ton, f.o.b. furnace, car lots | 42.50 |
| Ton lots or less, per ton | 47.50 |
| Silico-manganese, gross ton, delivered: | |
| 2.50% carbon grade | 105.00 |
| 1% carbon grade | 115.00 |
| Spot prices | $5 a ton higher |

# Old Material Quotations

## PITTSBURGH

**Per gross ton delivered consumers' yards:**

| | | |
|---|---|---|
| No. 1 heavy melting steel | $10.00 to | $10.50 |
| No. 2 heavy melting steel | 9.00 to | 9.50 |
| No. 2 railroad wrought | 10.00 to | 10.50 |
| Scrap rails | 10.00 to | 10.50 |
| Rails 3 ft. and under | 12.00 to | 12.50 |
| Sheet bar crops, ordinary | 11.00 to | 11.50 |
| Compressed sheet steel | 9.75 to | 10.25 |
| Hand bundled sheet steel | 9.00 to | 9.50 |
| Hvy. steel axle turnings | 9.00 to | 9.50 |
| Machine shop turnings | 6.75 to | 7.25 |
| Short shov. steel turnings | 6.75 to | 7.25 |
| Short mixed borings and turnings | 6.75 to | 7.25 |
| Cast iron borings | 6.75 to | 7.25 |
| Cast iron carwheels | 10.50 to | 11.00 |
| Heavy breakable cast | 8.00 to | 8.50 |
| No. 1 cast | 9.50 to | 10.50 |
| Railr. knuckles and couplers | 10.50 to | 11.50 |
| Rail. coil and leaf springs | 10.50 to | 11.50 |
| Rolled steel wheels | 10.50 to | 11.50 |
| Low phos. billet crops | 13.00 to | 13.50 |
| Low phos. sheet bar crops | 12.50 to | 13.00 |
| Low phos. plate scrap | 10.00 to | 11.50 |
| Low phos. punchings | 11.00 to | 12.00 |
| Steel car axles | 15.00 to | 15.50 |

## CHICAGO

**Delivered Chicago district consumers:**

*Per Gross Ton*

| | | |
|---|---|---|
| Heavy melting steel | $7.50 to | $8.00 |
| Shoveling steel | 7.50 to | 8.00 |
| Frogs, switches and guards | 7.50 to | 8.00 |
| Factory hyd. comp. sheets | 5.75 to | 6.25 |
| Drop forge flashings | 5.00 to | 5.50 |
| No. 1 busheling | 5.50 to | 6.00 |
| Rolled carwheels | 8.25 to | 9.25 |
| Railroad tires | 9.00 to | 9.50 |
| Railroad leaf springs | 9.50 to | 10.00 |
| Axle turnings | 5.75 to | 6.25 |
| Steel couplers and knuckles | 8.50 to | 9.00 |
| Coil springs | 9.50 to | 10.00 |
| Axle turnings (elec. fur.) | 6.00 to | 6.50 |
| Low phos. punchings | 10.00 to | 10.50 |
| Low phos. plates, 12 in. and under | 9.00 to | 9.50 |
| Cast iron borings | 3.50 to | 4.00 |
| Short shoveling turnings | 4.00 to | 4.50 |
| Machine shop turnings | 4.00 to | 4.50 |
| Rerolling rails | 10.50 to | 11.00 |
| Steel rails, less than 3 ft. | 9.25 to | 9.75 |
| Steel rails, less than 2 ft. | 10.00 to | 10.50 |
| Angle bars, steel | 8.25 to | 8.75 |
| Cast iron carwheels | 8.50 to | 9.00 |
| Railroad malleable | 7.00 to | 7.50 |
| Agricultural malleable | 7.00 to | 7.50 |
| *Relaying rails, 56 to 60 lb. | 19.00 to | 21.00 |
| *Relay. rails, 65 lb. and up | 22.00 to | 27.00 |

*Per Net Ton*

| | | |
|---|---|---|
| Iron angle and splice bars | 7.00 to | 7.50 |
| Iron arch bars, transoms | 7.50 to | 8.00 |
| Iron car axles | 13.50 to | 14.50 |
| Steel car axles | 10.50 to | 11.00 |
| No. 1 railroad wrought | 6.50 to | 7.00 |
| No. 2 railroad wrought | 6.50 to | 7.00 |
| No. 1 busheling | 5.00 to | 5.50 |
| No. 2 busheling | 4.00 to | 4.50 |
| Locomotive tires, smooth | 8.00 to | 9.00 |
| Pipes and flues | 3.25 to | 3.75 |
| No. 1 machinery cast | 8.50 to | 9.00 |
| Clean automobile cast | 7.50 to | 8.00 |
| No. 1 railroad cast | 7.00 to | 7.50 |
| No. 1 agricultural cast | 7.00 to | 7.50 |
| Stove plate | 6.25 to | 6.75 |
| Grate bars | 5.50 to | 6.00 |
| Brake shoes | 5.75 to | 6.25 |

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

## PHILADELPHIA

**Per gross ton delivered consumers' yards:**

| | | |
|---|---|---|
| No. 1 heavy melting steel | $7.25 to | $8.25 |
| No. 2 heavy melting steel | 6.00 to | 6.50 |
| No. 1 railroad wrought | 9.50 to | 10.00 |
| Bundled sheets | | 6.00 |
| Hydraulic compressed, new | 7.00 to | 7.50 |
| Hydraulic compressed, old | 6.00 to | 6.50 |
| Machine shop turnings | | 4.50 |
| Heavy axle turnings | 7.00 to | 8.00 |
| Cast borings (nom.) | | 3.50 |
| Heavy breakable cast | | 9.00 |
| Stove plate (steel works) | | 7.00 |
| No. 1 low phos. hvy. | 11.00 to | 12.00 |
| Couplers and knuckles | 10.00 to | 10.50 |
| Rolled steel wheels | 9.50 to | 10.00 |
| No. 1 blast furnace | | 3.50 |
| Spec. iron and steel pipe | | 10.50 |
| Shafting | 15.00 to | 15.50 |
| Steel axles | 15.00 to | 15.50 |
| No. 1 forge fire | 6.75 to | 7.25 |
| Cast iron carwheels | 11.50 to | 12.00 |
| No. 1 cast | 10.00 to | 10.50 |
| Cast borings (chem.) | 11.50 to | 12.00 |
| Steel rails for rolling | | 10.50 |

## CLEVELAND

**Per gross ton delivered consumers' yards:**

| | | |
|---|---|---|
| No. 1 heavy melting steel | $7.50 to | $8.00 |
| No. 2 heavy melting steel | 6.75 to | 7.25 |
| Compressed sheet steel | 7.00 to | 7.25 |
| Light bundled sheet stampings | 6.00 to | 6.50 |
| Drop forge flashings | 6.00 to | 6.25 |
| Machine-shop turnings | 4.50 to | 4.75 |
| Short shoveling turnings | 5.75 to | 6.25 |
| No. 1 busheling | 6.50 to | 6.75 |
| Steel axle turnings | 7.50 to | 8.00 |
| Low phos., billet crops | 14.00 to | 14.50 |
| Cast iron borings | 4.50 to | 4.75 |
| Mixed borings and short turnings | 4.50 to | 4.75 |
| No. 2 busheling | 4.50 to | 4.75 |
| No. 1 cast | 9.00 to | 9.50 |
| Railroad grate bars | 6.00 to | 6.50 |
| Stove plate | 6.00 to | 6.50 |
| Rails under 3 ft | 15.00 to | 15.50 |
| Rails for rolling | 13.00 to | 13.50 |
| Railroad malleable | 11.00 to | 11.25 |

## BUFFALO

**Per gross ton, f.o.b. Buffalo consumers' plants:**

| | | |
|---|---|---|
| No. 1 heavy melting steel | | $8.50 |
| No. 2 heavy melting scrap | $7.00 to | 7.50 |
| Scrap rails | 8.00 to | 8.50 |
| New hydraul. comp. sheets | | 7.00 |
| Old hydraul. comp. sheets | | 6.00 |
| Drop forge flashings | | 7.00 |
| No. 1 busheling | 7.00 to | 7.50 |
| Hvy. steel axle turnings | 8.00 to | 8.50 |
| Machine shop turnings | 4.50 to | 5.00 |
| Knuckles and couplers | | 10.00 |
| Coil and leaf springs | | 10.00 |
| Rolled steel wheels | | 10.00 |
| Low phos. billet crops | 12.50 to | 13.00 |
| Short shov. steel turnings | 7.00 to | 7.50 |
| Short mixed borings and turnings | 6.00 to | 6.50 |
| Cast iron borings | 6.00 to | 6.50 |
| No. 2 busheling | 4.50 to | 5.00 |
| Steel car axles | 10.00 to | 11.00 |
| Iron axles | 12.00 to | 12.50 |
| No. 1 machinery cast | 10.00 to | 10.50 |
| Stove plate | 8.25 to | 8.50 |
| Steel rails, 3 ft. and under | 12.00 to | 12.50 |
| Cast iron carwheels | 9.00 to | 9.50 |
| Industrial malleable | 9.50 to | 10.00 |
| Railroad malleable | 9.50 to | 10.00 |
| Chemical borings | 9.00 to | 9.50 |

## BIRMINGHAM

**Per gross ton delivered consumers' yards:**

| | | |
|---|---|---|
| Heavy melting steel | $8.50 to | $9.00 |
| Scrap steel rails | 8.00 to | 8.50 |
| Short shoveling turnings | 4.00 to | 5.00 |
| Stove plates | | 6.00 |
| Steel axles | | 14.00 |
| Iron axles | | 14.00 |
| No. 1 railroad wrought | | 6.50 |
| Rails for rolling | | 10.00 |
| No. 1 cast | | 9.00 |
| Tramcar wheels | 10.00 to | 10.25 |
| Cast iron borings, chem. | 12.00 to | 12.50 |

## ST. LOUIS

**Dealers' buying prices per gross ton:**

| | | |
|---|---|---|
| Selected heavy steel | $7.00 to | $7.50 |
| No. 1 heavy melting | 6.50 to | 7.00 |
| No. 2 heavy melting | 6.25 to | 6.75 |
| No. 1 locomotive tires | 8.00 to | 8.50 |
| Misc. stand-sec. rails | 8.00 to | 8.50 |
| Railroad springs | 8.75 to | 9.25 |
| Bundled sheets | 4.25 to | 4.75 |
| No. 2 railroad wrought | 6.50 to | 7.00 |
| No. 1 busheling | 6.00 to | 6.50 |
| Cast iron borings and shoveling turnings | 4.75 to | 5.25 |
| Iron rails | 7.00 to | 8.00 |
| Rails for rolling | 9.50 to | 10.00 |
| Machine shop turnings | 3.00 to | 3.50 |
| Heavy turnings | 5.50 to | 6.00 |
| Steel car axles | 10.00 to | 10.50 |
| Iron car axles | 14.00 to | 14.50 |
| Wrot. iron bars and trans. | 5.00 to | 5.50 |
| No. 1 railroad wrought | 4.75 to | 5.25 |
| Steel rails, less than 3 ft. | 10.00 to | 10.50 |
| Steel angle bars | 6.75 to | 7.25 |
| Cast iron carwheels | 6.50 to | 7.00 |
| No. 1 machinery cast | 8.00 to | 8.50 |
| Railroad malleable | 5.50 to | 6.00 |
| No. 1 railroad cast | 6.25 to | 6.75 |
| Stove plate | 6.00 to | 6.50 |
| Relay. rails, 60 lb. and under | 16.00 to | 16.50 |
| Relay. rails, 70 lb. and over | 20.00 to | 21.00 |
| Agricult. malleable | 5.00 to | 5.50 |

## NEW YORK

**Dealers' buying prices per gross ton:**

| | | |
|---|---|---|
| No. 1 heavy melting steel | $4.25 to | $5.50 |
| Heavy melting steel (yard) | 2.75 to | 3.00 |
| No. 1 hvy. breakable cast | 5.00 to | 5.50 |
| Stove plate (steel works) | 3.00 to | 3.50 |
| Machine shop turnings | 1.75 to | 2.00 |
| Short shoveling turnings | 1.75 to | 2.00 |
| Cast borings | 1.25 to | 1.50 |
| No. 1 blast furnace | 1.25 to | 1.50 |
| Steel car axles | 10.00 to | 10.50 |
| Iron car axles (nom.) | 14.00 to | 14.50 |
| Spec. iron and steel pipe | | 5.00 |
| Forge fire | | 3.25 |
| No. 1 railroad wrought | 5.00 to | 5.25 |
| No. 1 yard wrought, long | 4.00 to | 4.25 |
| Rails for rolling | 6.00 to | 6.25 |
| Stove plate (foundry) | 4.75 to | 5.25 |
| Malleable cast (railroad) | 6.00 to | 6.50 |
| Cast borings (chemical) | 8.00 to | 8.50 |

**Per gross ton, delivered local foundries:**

| | |
|---|---|
| No. 1 machinery cast | $8.50 |
| No. 1 hvy. cast (cupola size) | 6.50 |
| No. 2 cast | 5.50 |

## BOSTON

**Dealers' buying prices per gross ton:**

| | | |
|---|---|---|
| No. 1 heavy melting steel | $3.80 to | $4.60 |
| Scrap T rails | 3.10 to | 4.60 |
| Machine shop turnings | 1.25 to | 2.10 |
| Cast iron borings | 1.50 to | 1.75 |
| Bundled skeleton, long | 3.00 to | 3.25 |
| Forge flashings | 3.00 to | 3.50 |
| Blast furnace scrap | 1.25 to | 1.30 |
| Forged scrap | 2.00 to | 2.50 |
| Shafting | 10.00 to | 10.50 |
| Steel car axles | 11.00 to | 12.00 |
| Wrought pipe | 4.00 to | 4.25 |
| Rails for rolling | 6.00 to | 6.50 |
| Cast iron borings, chemical | 7.00 to | 7.25 |

**Per gross ton delivered consumers' yards:**

| | | |
|---|---|---|
| Textile cast | $8.75 to | $9.25 |
| No. 1 machinery cast | 8.75 to | 9.25 |
| Stove plate | 5.00 to | 5.25 |
| Railroad malleable | 10.50 to | 11.00 |

## CINCINNATI

**Dealers' buying prices per gross ton:**

| | | |
|---|---|---|
| Heavy melting steel | $6.75 to | $7.25 |
| Scrap rails for melting | 8.50 to | 9.00 |
| Loose sheet clippings | 3.50 to | 4.00 |
| Bundled sheets | 5.50 to | 6.00 |
| Cast iron borings | 3.25 to | 3.75 |
| Machine shop turnings | 4.00 to | 4.50 |
| No. 1 busheling | 5.00 to | 5.50 |
| No. 2 busheling | 3.25 to | 3.75 |
| Rails for rolling | 9.00 to | 9.50 |
| No. 1 locomotive tires | 8.50 to | 9.00 |
| Short rails | 11.75 to | 12.25 |
| Cast iron carwheels | 8.25 to | 8.75 |
| No. 1 machinery cast | 10.00 to | 10.50 |
| No. 1 railroad cast | 8.75 to | 9.25 |
| Burnt cast | 4.25 to | 4.75 |
| Stove plate | 4.25 to | 4.75 |
| Agricultural malleable | 8.00 to | 8.50 |
| Railroad malleable | 9.00 to | 9.50 |

## DETROIT

**Dealers' buying prices per gross ton:**

| | | |
|---|---|---|
| Hvy. melting | $6.00 to | $6.50 |
| Borings and short turnings | 3.75 to | 4.25 |
| Long turnings | 3.50 to | 4.00 |
| No. 1 machinery cast | 8.50 to | 9.00 |
| Automotive cast | 11.00 to | 11.50 |
| Hydraul. comp. sheets | 5.75 to | 6.25 |
| Stove plate | 5.00 to | 5.50 |
| New No. 1 busheling | 5.00 to | 5.50 |
| Old No. 2 busheling | 3.25 to | 3.75 |
| Sheet clippings | 3.50 to | 4.00 |
| Flashings | 5.25 to | 5.75 |

## CANADA

**Dealers' buying prices per gross ton:**

| | Toronto | Montreal |
|---|---|---|
| Heavy melting steel | $7.00 | $6.00 |
| Rails, scrap | 7.00 | 6.00 |
| No. 1 wrought | 6.00 | 8.00 |
| Machine shop turnings | 2.00 | 2.00 |
| Boiler plate | 5.00 | 4.50 |
| Heavy axle turnings | 2.50 | 2.50 |
| Cast borings | 2.00 | 2.00 |
| Steel borings | 2.00 | 2.00 |
| Wrought pipe | 2.00 | 2.00 |
| Steel axles | 7.00 | 9.00 |
| Axles, wrought iron | 7.00 | 11.00 |
| No. 1 machinery cast | 12.50 | 10.00 |
| Stove plate | 10.00 | 8.00 |
| Standard carwheels | 11.00 | 8.50 |
| Malleable | 10.00 | 8.00 |

# Warehouse Prices for Iron and Steel Products

## CHICAGO

| | Base per Lb. |
|---|---|
| Plates and structural shapes | 3.00c. |
| Soft steel bars | 2.75c. |
| Reinforcing bars, billet steel | 1.50c. to 1.80c. |
| Rail steel reinforcement— | |
| For buildings | 1.30c. to 1.55c. |
| Road slabs, bridges, culverts | 1.40c. |
| Cold-fin. steel bars and shafting— | |
| Rounds and hexagons | 3.10c. |
| Flats and squares | 3.60c. |
| Bands, ⅞ in. (in Nos. 10 and 12 gages) | 2.95c. |
| Hoops (No. 14 gage and lighter) | 3.50c. |
| Hot-rolled annealed sheets (No. 24) | 3.55c. |
| Galv. sheets (No. 24) | 4.10c. |
| Hot-rolled sheets (No. 10) | 3.20c. |
| Spikes (⅝ in. and larger) | 2.45c. |
| Track bolts | 4.30c. |
| Rivets, structural | 4.00c. |
| Rivets, boiler | 4.00c. |
| | Per Cent Off List |
| Machine bolts | 73 |
| Carriage bolts | 73 |
| Coach and lag screws | 73 |
| Hot-pressed nuts, sq., tap. or blank | 73 |
| Hot-pressed nuts, hex., tap. or blank | 73 |
| No. 8 black ann'l'd wire, per 100 lb. | $3.45 |
| Com. wire nails, base per keg | 2.30 |
| Cement c'l'd nails, base per keg | 2.30 |

## CLEVELAND

| | Base per Lb. |
|---|---|
| Plates and struc. shapes | 2.95c. |
| Soft steel bars | 2.75c. |
| Reinforc. steel bars | 1.75c. to 1.95c. |
| Cold-fin. rounds and hex | 3.10c. |
| Cold-fin. flats and sq. | 3.60c. |
| Hoops and bands, No. 12 to ⅞ in., inclusive | 3.00c. |
| Hoops and bands, No. 13 and lighter | 3.55c. |
| Cold-finished strip | *5.55c. |
| Hot-rolled annealed sheets (No. 24) | 3.60c. |
| Galvanized sheets (No. 24) | 4.00c. |
| Hot-rolled sheets (No. 10) | 3.00c. |
| No. 9 ann'l'd wire, per 100 lb. | $2.25 |
| No. 9 galv. wire, per 100 lb. | 2.70 |
| Com. wire nails, base per keg | 2.25 |

*Net base, including boxing and cutting to length.

## CINCINNATI

| | Base per Lb. |
|---|---|
| Plates and struc. shapes | 3.25c. |
| Bars, soft steel or iron | 3.00c. |
| New billet reinforc. bars | 3.00c. |
| Rail steel reinforc. bars | 3.00c. |
| Hoops | 3.90c. |
| Bands | 3.20c. |
| Cold-fin. rounds and hex | 3.50c. |
| Squares | 4.00c. |
| Hot-rolled annealed sheets (No. 24) | 3.75c. |
| Galv. sheets (No. 24) | 4.25c. |
| Hot-rolled sheets (No. 10) | 3.30c. |
| Structural rivets | 4.20c. |
| Small rivets | 60 per cent off list |
| No. 9 ann'l'd wire, per 100 lb. | $3.00 |
| Com. wire nails, base per keg (10 to 49 kegs) | 2.65 |
| Larger quantities | 2.50 |
| Cement c'l'd nails, base 100-lb. keg | 2.95 |
| Chain, per 100 lb. | 10.25 |
| | Net per 100 Ft. |
| Seamless steel boiler tubes, 2-in. | $17.50 |
| 4-in. | 36.00 |
| Lap-welded steel boiler tubes, 2-in. | 16.50 |
| 4-in. | 34.50 |

## BUFFALO

| | Base per Lb. |
|---|---|
| Plates and struc. shapes | 3.25c. |
| Soft steel bars | 3.00c. |
| Reinforcing bars | 2.65c. |
| Cold-fin. flats and sq. | 3.65c. |
| Rounds and hex | 3.15c. |
| Cold-rolled strip steel | 5.25c. |
| Hot-rolled annealed sheets (No. 24) | 3.70c. |
| Galv. sheets (No. 24) | 4.10c. |
| Bands | 3.35c. |
| Hoops | 3.90c. |
| Hot-rolled sheets (No. 10) | 3.50c. |
| Com. wire nails, base per keg | $2.45 |
| Black wire, base per 100 lb. | 3.20 |

## NEW YORK

| | Base per Lb. |
|---|---|
| Plates and struc. shapes | 2.70c. to 3.10c. |
| Soft steel bars, small shapes | 2.70c. to 3.10c. |
| Iron bars | 3.24c. |
| Iron bars, Swed. charcoal | 7.00c. to 7.25c. |
| Cold-fin. shafting and screw stock: | |
| Rounds and hexagons | 3.40c. |
| Flats and squares | 3.90c. |
| Cold-roll. strip, soft and quarter hard | 4.95c. |
| Hoops | 3.75c. |
| Bands | 3.40c. |
| Hot-rolled sheets (No. 10) | 3.00c. to 3.25c. |
| Hot-rolled ann'l'd sheets (No. 24*) | 3.60c. |
| Galvanized sheets (No. 24*) | 4.00c. |
| Long terne sheets (No. 24) | 5.00c. |
| Standard tool steel | 12.00c. |
| Wire, black annealed | 4.50c. |
| Wire, galv. annealed | 5.15c. |
| Tire steel, ⅝ x ⅛ in. and larger | 3.40c. |
| Smooth finish, 1 to 2½ x ¼ in. and larger | 3.75c. |
| Open-hearth spring steel, bases, | 4.50c. to 7.00c. |

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

| | Per Cent Off List |
|---|---|
| Machine bolts, cut thread: | |
| ¾ x 6 in. and smaller | 65 to 65 and 10 |
| 1 x 30 in. and smaller | 65 to 65 and 10 |
| Carriage bolts, cut thread: | |
| ½ x 6 in. and smaller | 65 to 65 and 10 |
| ¾ x 20 in. and smaller | 65 to 65 and 10 |
| Boiler Tubes: | Per 100 Ft. |
| Lap welded, 2-in. | $19.00 |
| Seamless steel, 2-in. | 20.25 |
| Charcoal iron, 2-in. | 26.25 |
| Charcoal iron, 4-in. | 67.00 |

## ST. LOUIS

| | Base per Lb. |
|---|---|
| Plates and struc. shapes | 3.25c. |
| Bars, soft steel or iron | 3.00c. |
| Cold-fin. rounds, shafting, screw stock | 3.35c. |
| Hot-rolled annealed sheets (No. 24) | 3.80c. |
| Galv. sheets (No. 24) | 4.35c. |
| Hot-rolled sheets (No. 10) | 3.45c. |
| Black corrug. sheets (No. 24) | 3.85c. |
| Galv. corrug. sheets | 4.40c. |
| Structural rivets | 4.00c. |
| Boiler rivets | 4.00c. |
| | Per Cent Off List |
| Tank rivets, ⅞-in. and smaller, 100 lb. or more | 65 |
| Less than 100 lb. | 60 |
| Machine bolts | 73 |
| Carriage bolts | 73 |
| Lag screws | 73 |
| Hot-pressed nuts, sq., blank or tapped, 200 lb. or more | 73 |
| Less than 200 lb. | 63 |
| Hot-pressed nuts, hex., blank or tapped, 200 lb. or more | 73 |
| Less than 200 lb. | 63 |

## PACIFIC COAST

| | Base per Lb. San Francisco | Los Angeles | Seattle |
|---|---|---|---|
| Plates and struc. shapes, ¼-in. and heavier | 2.80c. | 3.00c. | 2.50c. |
| Soft steel bars | 2.80c. | 3.00c. | 2.50c. |
| Reinforcing bars | 2.80c. | 2.80c. | 3.00c. |
| Hot-rolled annealed sheets (No. 24) | 3.90c. | 4.00c. | 4.00c. |
| Hot-rolled sheets (No. 10) | 3.40c. | 3.50c. | 3.50c. |
| Galv. sheets (No. 24) | 4.40c. | 4.20c. | 4.50c. |
| Struc. rivets, ½ in. and larger, less than 1000 lb. | 5.00c. | 5.00c. | 5.50c. |
| Special nails; common 4 to 60d; smooth box 4 to 20d; finish 6 and 8d; base per keg | $2.55 | $2.45 | $2.40 |
| Other wire nails, base per keg | 2.80 | 2.70 | 2.65 |
| Cement c'l'd nails, 100-lb. keg | 2.65 | 2.70 | 2.65 |

San Francisco and Los Angeles schedule subject to allowance of 10c. per 100 lb. for 5000 lb. or over.

Seattle schedule subject to allowance of 25c. per 100 lb. for 500 lb. or over.

## PITTSBURGH

| | *Base per Lb. |
|---|---|
| Plates | 2.85c. |
| Structural shapes | 2.85c. |
| Soft steel bars and small shapes | 2.60c. |
| Reinforcing steel bars | 2.60c. |
| Cold-finished and screw stock— | |
| Rounds and hexagons | 3.10c. |
| Squares and flats | 3.60c. |
| Bands | 2.95c. |
| Hoops | 3.60c. |
| Hot-rolled annealed sheets (No. 24), 25 or more bundles | 3.05c. |
| Galv. sheets (No. 24), 25 or more bundles | 3.65c. |
| Hot-rolled sheets (No. 10) | 3.15c. to 3.20c. |
| Galv. corrug. sheets (No. 28), per square (less than 3750 lb.) | 3.74c. |
| Spikes, large | 2.50c. |
| Small | 2.75c. to 2.90c. |
| Boat | 3.00c. |
| Track bolts, all sizes, per 100 count, | 70 and 10 per cent off list |
| Machine bolts, 100 count, | 70 and 10 per cent off list |
| Carriage bolts, 100 count, | 70 and 10 per cent off list |
| Nuts, all styles, 100 count, | 73 and 10 per cent off list |
| Large rivets, base per 100 lb. | $3.00 |
| Wire, black, soft ann'l'd, base per 100 lb. | 2.30 |
| Wire, galv. soft, base per 100 lb. | 2.75 |
| Common wire nails, per keg | 2.25 |
| Cement coated nails, per keg | 2.25 |

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 999 lb.

## PHILADELPHIA

| | Base per Lb. |
|---|---|
| Plates, ¼-in. and heavier | 2.50c. |
| Structural shapes | 2.50c. |
| Soft steel bars, small shapes, iron bars (except bands) | 2.60c. |
| Reinforc. steel bars, sq., twisted and deform. | 2.30c. |
| Cold-fin. steel, rounds and hex. | 3.40c. |
| Cold-fin. steel, sq. and flats | 3.90c. |
| Steel hoops | 3.15c. |
| Steel bands, No. 12 to ⅞-in., inclu. | 2.90c. |
| Spring steel | 5.00c. |
| Hot-rolled box annealed sheets (No. 24) | 3.55c. |
| Galvanized sheets (No. 24) | 4.00c. |
| Hot-rolled blue annealed sheets (No. 10) | 3.05c. |
| Diam. pat. floor plates, ¼ in. | 5.10c. |
| Swedish iron bars | 6.60c. |

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

## BOSTON

| | Base per Lb. |
|---|---|
| Plates | *3.35c. |
| Structural shapes | *3.35c. |
| Soft steel bars, small shapes | *3.25c. |
| Reinforcing bars | 3.10c. to 3.25c. |
| Iron bars— | |
| Refined | 3.25c. |
| Best refined | 4.60c. |
| Spring steel, open-hearth | 5.00c. |
| Tire steel | 4.50c. to 4.75c. |
| Bands | *3.75c. to 4.25c. |
| Hoop steel | 4.90c. to 5.40c. |
| Cold-rolled steel— | |
| Rounds and hex | 3.50c. to 5.50c. |
| Squares and flats | 4.00c. to 6.00c. |
| Rivets, structural or boiler | 4.80c. |
| | Per Cent Off List |
| Machine bolts | 70 |
| Carriage bolts | 70 |
| Lag screws | 70 |
| Hot-pressed nuts | 40 and 10 |
| Cold-punched nuts | 40 and 10 |
| Stove bolts | 70 and 10 |

*Base price (250 to 999 lb.); less than 250 lb., add 50c. per 100 lb.; 1000 to 7999 lb., deduct 15c.; 8000 to 14,999 lb., deduct 25c.; 15,000 lb. and larger lots, deduct 35c.

# Fabricated Structural Steel

## Awards of 16,600 Tons, Include 10,850 Tons of Bridges—New Projects Total 13,500 Tons

FABRICATED steel awards total 16,600 tons, compared with 17,500 tons a week ago. Contributing liberally to this week's total is 10,850 tons of city, county and State bridge construction in Indiana, Illinois, Wisconsin, Minnesota, Missouri, Idaho, Oklahoma, Texas and California.

New projects are smaller this week with a total of 13,500 tons, compared with 17,500 tons a week ago and 31,000 tons two weeks ago. Among the larger jobs in prospect are a building for Syracuse University, Syracuse, N. Y., 600 tons, and incinerators in Washington and Georgetown, 533 tons. Awards follow:

### NORTH ATLANTIC STATES

**New York,** 7400 tons, steel piling, Piers 88, 90 and 92, Hudson River, for Department of Docks, to Bethlehem Steel Corpn.; Allen N. Spooner & Son, Inc., New York, general contractor.

**New York,** 125 tons, two-story garage at 28 Rose Street, to Easton Structural Steel Co.

**Brooklyn,** 839 tons, Bishop Loughlin Memorial High School; American Bridge Co., fabricator, and National Bridge Works, erector.

**Long Island City, N. Y.,** 750 tons, buildings for Knickerbocker Laundry Co., to McClintic-Marshall Corpn.

**Wilmington, Del.,** 450 tons, highway bridge, to American Bridge Co.

**Annapolis, Md.,** 250 tons, high school, to Lehigh Structural Steel Co.

**Pennsylvania Railroad,** 100 tons, conduit supports for electrification at Baltimore, to Belmont Iron Works.

**Philadelphia,** 150 tons, public school at Thirty-second and Tasker Streets, to McClintic-Marshall Corpn.

**Philadelphia,** 135 tons, school on Rising Sun Avenue, to H. A. Hitner's Sons Co.

**Philadelphia,** 170 tons, office building for Electric Realty Co., to McClintic-Marshall Corpn.

### CENTRAL STATES

**Green Bay, Wis.,** 440 tons, Monroe Avenue bridge, to Lakeside Bridge & Steel Co., Milwaukee.

**Detroit,** 145 tons, caisson rings for Detroit post office, to Whitehead & Kales Co.

**State of Indiana,** 1200 tons, highway bridges, to Missouri Valley Bridge & Iron Co., Leavenworth, Kan.

**Chicago,** 1700 tons, Jackson and Jefferson Street bridges, to Missouri Valley Bridge & Iron Co.

**Chicago,** 1250 tons, boiler house for Chicago Union Station, to American Bridge Co.

**St. Paul, Minn.,** 200 tons, State work to Lakeside Bridge & Steel Co.

**State of Minnesota,** 1350 tons, highway bridges; 100 tons to Illinois Steel Bridge Co., Jacksonville, Ill., 650 tons to Minneapolis-Moline Power Implement Co., 600 tons to American Bridge Co.

**Marseilles, Ill.,** 300 tons, highway bridge, to International Steel Co.

**Peoria, Ill.,** 2100 tons, East approach to bridge across Illinois, to Wisconsin Bridge & Iron Co.

**Joliet, Ill.,** 1500 tons, highway bridges, to Mississippi Valley Structural Steel Co.

**Joliet,** 900 tons, bridge to Independent Bridge Co., Pittsburgh.

**State of Illinois,** 200 tons, Brandon bridge, to Independent Bridge Co.

**St. Louis,** 210 tons, I beam spans for Missouri Pacific Railway, to McClintic-Marshall Corpn.

**Chariton County, Mo.,** 160 tons, State highway bridge, to Clinton Bridge & Iron Works.

**Grundy County, Mo.,** 200 tons, highway bridges, to St. Joseph Structural Steel Co.

### WESTERN STATES

**Boise County, Idaho,** 200 tons, National Forest highway bridge, to an unnamed bidder.

**Los Angeles County, Cal.,** 170 tons, Alamitos Bay bridge, to Consolidated Steel Co.

### SOUTH AND SOUTHWEST

**Oklahoma City,** 140 tons, bridge for State Highway Commission, to Clinton Bridge & Iron Works.

**State of Texas,** 250 tons, highway bridge in Runnels County, to Mosher Steel & Machinery Co.

**Concho County, Tex.,** 240 tons, truss and I-beam spans; truss spans to Pittsburgh-Des Moines Steel Co.; I-beam to Austin Brothers.

### CANAL ZONE

**Panama,** 485 tons, concrete mixing plant for Callahan Construction Co., general contractors for Madden Dam, to Stupp Brothers Bridge & Iron Co.

## NEW STRUCTURAL STEEL PROJECTS

### NORTH ATLANTIC STATES

**Portland, Me.,** 300 tons, telephone building.

**Fall River, Mass.,** 155 tons, hospital and nurses' home.

**Dedham, Mass.,** 125 tons, church.

**Mount Kisco, N. Y.,** 100 tons, municipal building.

**New York,** 150 tons, addition to Fordham Hospital nurses' home.

**New York,** 120 tons, Nurses' Home on Welfare Island.

**New York,** 250 tons, public school No. 16 in Queens.

**Ossining, N. Y.,** 380 tons, buildings for Sing Sing prison.

**Maybrook, N. Y.,** 550 tons, highway bridge.

**Syracuse, N. Y.,** 600 tons, building for Syracuse University.

**Rochester, N. Y.,** 250 tons, Monroe County home.

**Trenton, N. J.,** 300 tons, addition to municipal terminal.

**Lancaster, Pa.,** 200 tons, highway bridge.

**Pittsburgh,** 450 tons, Carson Street bridge for Allegheny County.

**Elkton, Md.,** 400 tons, highway bridge.

**Buffalo,** 180 tons, warehouse and service building for Westinghouse Electric & Mfg. Co.

**Philadelphia,** 3000 tons, Franklin Memorial building; postponed until after Jan. 1.

**Bordentown, N. J.,** 250 tons, school for State Department of Institutions and Agencies.

**Pennsylvania Railroad,** 388 tons, electrification construction at Curryville, Md.; low bidder, American Bridge Co.

**Washington,** 533 tons, two incinerators for Government, O Street, 378 tons Rust Engineering Co., Pittsburgh contractor; Georgetown, 155 tons, Northeastern Construction Co., Baltimore; contractor.

**Bellevue, Del.,** 150 tons, elementary and high school.

**Waymart, Pa.,** 250 tons, ward buildings and assembly buildings for Farview State Hospital.

**Washington,** unstated tonnage, warehouse and garage for Standard Oil Co.

### CENTRAL STATES

**Justice Park, Ill.,** 4100 tons, viaduct; bids rejected, to be re-advertised Dec. 21.

**Columbus, Ohio,** 550 tons, grade crossing.

**Battle Creek, Mich.,** 500 tons, Kellogg High School.

**State of Michigan,** 500 tons, highway bridge; bids taken.

**Manteno, Ill.,** 400 tons, State institutional building.

### THE SOUTH

**Lynchburg, Va.,** 400 tons, State armory and market building; old inquiry renewed.

**Lynchburg, Va.,** 380 tons, post office; general contractor in Chicago district.

**State of Florida,** 320 tons, Nassau River bridge; general contractor in Cincinnati.

**Augusta, Ga.,** 450 tons, highway bridge.

### WESTERN STATES

**Butte, Mont.,** 200 tons, post office.

**Long Beach, Cal.,** 250 tons, grade separation at Orange and Hill Streets, Consolidated Steel Co., low bidder.

**Long Beach,** 200 tons, pier sheds.

### CANADA

**Toronto,** 200 tons, addition to Oakwood Collegiate Institute, for Board of Education.

### FABRICATED PLATES AWARDS

**Los Angeles,** 525 tons, pipe line and penstocks, to Consolidated Steel Co.

**Cle Elum, Wash.,** 122 tons, tunnel lining for reclamation project, to McClintic-Marshall Corpn.

**Western Maryland Railroad,** 223 tons, molasses tanks at Baltimore, to Pittsburgh-Des Moines Steel Co.

### NEW PROJECTS

**Signal Hill, Cal.,** 850 tons, five mile pipe line alternate.

**Pennsylvania Railroad,** 290 tons of fabricated plates and 97 tons of floor plates for electrification work at Curryville, Md. Low bidder, American Bridge Co.

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# Detroit Scrap Market Sluggish and Weak

DETROIT, Dec. 15.—There has been little business the past week to test the local scrap market. Dealers expect the present sluggishness to persist until at least the early part of January. Borings and turnings are weak, although there has been no change in prices.

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Shipments of railroad locomotives in September consisted of nine steam units, all for domestic use, and compare with August shipments of four such units, also for domestic use, according to reports received by the Bureau of the Census from manufacturers. Unfilled orders at the end of September amounted to 112 locomotives, as against 120 at the end of August.

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Application has been made to the Tariff Commission by William W. Hearne, Inc., Philadelphia, for a decrease in the duty of 1c. a lb., contained manganese, on ferruginous manganese ore.

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Sales of Babbitt metal in October, reported to the Bureau of the Census, totaled 1,495,185 lb., against 1,355,415 lb. in September. Output was 2,047,100 lb., compared with 1,851,956 lb.

## William Green Advocates 7-hr. Day, 5-day Week

A national shorter workday and shorter workweek were advocated as possible remedies for economic recovery by William Green, president, American Federation of Labor, in a radio address. He suggested that a 7-hr. day, five-day week schedule in industrial and manufacturing plants throughout the United States would provide employment for all willing and able workers. Work security was also stressed by Mr. Green as a means of mitigating fear of unemployment; it would tend to effect a reversal in the mental attitude of workers and serve to stimulate the latent buying power of the nation.

"The application of these practical remedies," said Mr. Green, "should be supplemented by the inauguration and application of a more scientific and practical wage policy. The practice of wage cutting should cease. The fight should be to maintain price levels, including wages. The income of the wage earners of the nation should be increased to the point where their buying power would balance with industrial production. It is a simple fact that prosperity cannot be established and maintained except when the relationship of the buying power of the masses of the people corresponds with the production of industry.

"We cannot produce more than we can consume, and at the same time maintain prosperous conditions. The relationship between buying power and economic recovery is so close as to make the existence of one dependent upon the other. There will be no substantial, genuine improvement in the economic condition of the nation until the buying power of the people has been built back so that they will not only be able to buy, but anxious and willing to buy the commodities which industry produces.

**Extension of Buying Power**

"Facilities for the extension and development of buying power to a maximum capacity should be created through the extension of sound and adequate credit opportunities. This can be brought about through the enlargement and creation of credit institutions available for the use of men and women who may be classed as wage earners and of a class of our citizenship possessed of modest means. The responsibility for the application of remedies to the existing situation must rest with the owners and managers of industry and with those who control the economic and financial institutions of the nation. Policies, both economic and financial, are originated and applied by those who own and control industry. They must face the facts and they must apply the remedies which are evidently necessary if we are to overcome our existing difficulties and bring about a return of prosperity. The question is, will these men who possess the power to restore buying power and establish economic balance act collectively, apply the remedies and start the nation on the open roadway to economic recovery?"

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## Unfilled Steel Orders at 21-Year Low

Unfilled orders of the United States Steel Corpn., as of Nov. 30, amounted to 2,933,891 tons. This represents a drop of 185,541 tons from Oct. 31 and puts the total at the lowest, with three exceptions, ever reported. For the last three months of 1910 a lower figure was reached, that for Dec. 31 having been 2,674,757 tons, the lowest of all.

November has shown, on the average of 1910 to 1930 inclusive, an increase of about 135,000 tons. In the 10 years 1921 to 1930 the average increase was about 93,000 tons. The current decline is the eighth successive monthly downward movement, during which the total has lost 1,061,439 tons.

Unfilled orders at the end of each month since the beginning of 1929 follow:

| | 1931 Tons | 1930 Tons | 1929 Tons |
|---|---|---|---|
| January | 4,132,351 | 4,468,710 | 4,109,487 |
| February | 3,965,194 | 4,479,748 | 4,144,341 |
| March | 3,995,330 | 4,570,653 | 4,410,718 |
| April | 3,897,729 | 4,354,220 | 4,427,763 |
| May | 3,620,452 | 4,059,227 | 4,304,167 |
| June | 3,479,323 | 3,968,064 | 4,256,910 |
| July | 3,406,816 | 4,022,055 | 4,088,177 |
| August | 3,169,457 | 3,580,204 | 3,658,211 |
| September | 3,144,833 | 3,424,338 | 3,902,581 |
| October | 3,119,432 | 3,481,763 | 4,086,562 |
| November | 2,933,891 | 3,639,636 | 4,125,345 |
| December | ..... | 3,943,596 | 4,417,193 |

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## Steel Furniture Orders Gained in October

WASHINGTON, Dec. 15.—Orders for business steel furniture in October totaled $1,112,917, against $1,058,565 in September, according to reports received by the Bureau of the Census. In 10 months of 1931 orders aggregated $13,081,655, compared with $21,019,212 in the corresponding period of last year. Orders for shelving furniture in October were reported at $304,118, against $303,671 in September. In 10 months, orders for this group of furniture totaled $3,884,260, against $7,314,069 in the corresponding period of last year.

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Herbert S. Glasby, who for the past few years has been associated with Acme Wire Co., New Haven, Conn., has opened a sales office at 123 South Broad Street, Philadelphia, where he will handle the Acme company's products. He will also represent National Harris Wire Co., Newark, N. J.; Macallen Co., Boston, and Waterbury Button Co., Waterbury, Conn.

## Further Shrinkage of Trackwork Shipments

Production and shipment in November of trackwork for T-rail track of 60 lb. and over are reported by the American Iron and Steel Institute at 1948 gross tons, much the smallest figure since these products have been reported monthly. The drop from the 2162 tons of October was about 10 per cent, while the November total was less than half that of November, 1930, and only slightly more than one-sixth that of November, 1929. Preceding September, every month ever reported had more than double the output of November.

For the 11 months of 1931, the total output was 58,528 tons, compared with 104,942 tons in the first 11 months of 1930 and 151,289 tons in 1929.

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## British Railroad Lays Longer Rails

LONDON, ENGLAND, Dec. 5.—The London Electric Railway, Middlesbrough, has just received the first part of a 1350-ton order for 95-lb. rails, which are 90 ft. in length. This is about 30 ft. longer than the usual standard in England. The railroad believes that this length will be desirable as it will permit reduction in the number of fishplates, bolts and nuts, and provide increased smoothness for the rolling stock. The rails are all being "oven-cooled," a process developed by the Cargo Fleet Iron Co. in conjunction with Messrs. Sandberg.

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## New Corrosion-Resistant Steel Piling Developed

DÜSSELDORF, GERMANY, Dec. 2.—A new type of sheet steel piling is being offered by the Vereinigte Stahlwerke A. G., especially recommended for embankments, flood gates, wharf construction, river dams and ground water protection walls. The piling, known as "Union Resista," is of corrosion-resisting alloy steel, not of the copper bearing type. The links of the piling are said to be completely waterproof. An export market for the new product is being sought in tropical countries.

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## Wheat Pays for Steel

HAMBURG, GERMANY, Dec. 5.—An offer of the Soviet Union to Czechoslovakia, to exchange 50,000 tons of wheat for steel of an equivalent value, has been accepted and details are now being negotiated.

# British Still Buy Continental Steel; Indian Sheet Bars Shipped to Wales

(*By Cable*)

LONDON, ENGLAND, Dec. 14.

THERE is increasing doubt that an iron and steel tariff will be applied soon. Markets are quiet with the usual seasonal lull approaching.

Tin plate prices are firm and the market is active as a result of renewed efforts to establish a tin plate conference. Inquiries and orders are good in both the domestic and export markets.

At present a few mills are accepting business at 14s. ($2.34) per base box, f.o.b. works port, while others are asking up to 14s. 9d. ($2.46) per base box. Additional business with American users is being negotiated.

United Kingdom imports of Continental iron and steel in November were in excess of 300,000 tons, so that consumers are now stocked for some months in advance.

Current purchases of Continental steel by British users are small, although the European mills are quoting lower prices in the gold pound sterling. Order books of Belgian mills will probably be much smaller in January, and operating rates are being further curtailed.

French mill operations at present are about 50 per cent of capacity, but merchant bars and shapes are being offered on three weeks' delivery terms. German producers, however, are offering prompt shipment on all products.

British exports of iron and steel in November were 196,000 tons, of which 18,000 tons was pig iron. No pig iron was shipped to the United States.

A recent foreign transaction of note is the sale of 5000 tons of Indian sheet bars for shipment from Calcutta to Cardiff, Wales.

With the United Kingdom willing to continue as a member, negotiations for renewal of the International Tube Cartel are proceeding favorably. A meeting has been proposed for Dec. 19, in Paris, to discuss establishment of international sales offices for semi-finished material and shapes.

In Poland, the Laurahütte is preparing to suspend operation of its rolling mills during the first quarter. The Polish Friedenshütte is reported seeking judicial supervision.

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## Polish Tool Builders Take Soviet Order

BERLIN, GERMANY, Dec. 3.—A machine tool order totaling $470,000 has been awarded by the Soviet to a Polish company known as the "Association of Polish Mechanics From America." The company consists of some 50 Polish mechanics, who after many years' experience in building machine tools in the United States, returned to Poland and formed their own company.

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## Japanese Railroads to Test Long Rails

YOKOHAMA, JAPAN, Nov. 14.—The Imperial Government Railways is negotiating with the Seitetsu Jo (Government Steel Works) for a trial order of 37-kg. (82-lb.) rails, 24 meters (79 ft.) in length. If the longer rail is found to be satisfactory in service, the railroads are expected to adopt it as standard.

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## Copper Sales to Germany Made by Direct Agencies

HAMBURG, GERMANY, Dec. 5.—Non-members of Copper Exporters, Inc., who are directly represented in the German market, are booking a substantial amount of German copper requirements. Certain Canadian, Mexican and Japanese outsiders have agents here, and the American interest, the Phelps Dodge Corpn., is stated to have arranged for direct sales.

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## German Rustless Steel Exports Increase

HAMBURG, GERMANY, Dec. 5.—Despite depressed conditions in most branches of the steel industry, German export business in rustless steel has steadily gained in 1931. In addition to a wide range of hardware products, increasing quantities of machine parts and accessories, chain, cable and tubes have been sold. Demand for rustless steel tubing has increased from breweries and chemical plants. In the third quarter of this year, German rustless steel exports averaged $40,000 a month in hardware products and $50,000 in sheets, tubing and machine parts.

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## British Steel Tie Maker Uses Volume Production

LONDON, ENGLAND, Dec. 5.—Straightline production of steel railroad ties is being employed at the Glengarnock works of David Colville & Sons, Ltd., Glasgow, to execute an order for China. Rolled sections pass from the furnace to presses, where they are shaped and punched. Moving on a chain conveyor, the ties are brushed and turned and carried to a dipping tank for coating with a bitumastic solution, after which they are piled for inspection. The production rate varies with the type of tie being made, but is about seven a minute for ties weighing 136.74 lb.

### British and Continental European Export Prices f.o.b. United Kingdom and Continental Ports

#### British Prices, f.o.b. United Kingdom Ports

*Per Gross Ton, £ at $3.35*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ferromanganese, export | £9 | 0s. | | | | $30.15 | | | |
| Billets, open-hearth | 5 | 7½ | to | £5 | 12½s. | 18.00 | to | $18.84 | |
| Black sheets, Japanese specifications | 9 | 7½ | to | 9 | 10 | 31.40 | to | 31.82 | |
| Tin plate, per base box | 0 | 14 | to | 0 | 14¾ | 2.34 | to | 2.46 | |
| | | | | | | Cents a Lb. | | | |
| Steel bars, open-hearth | 7 | 17½ | to | 8 | 7½ | 1.18 | to | 1.25 | |
| Beams, open-hearth | 7 | 7½ | to | 7 | 17½ | 1.10 | to | 1.18 | |
| Channels, open-hearth | 7 | 12½ | to | 8 | 2½ | 1.14 | to | 1.22 | |
| Angles, open-hearth | 7 | 7½ | to | 7 | 17½ | 1.10 | to | 1.18 | |
| Black sheets, No. 24 gage | 8 | 5 | to | 8 | 10 | 1.23 | to | 1.27 | |
| Galvanized sheets, No. 24 gage | 9 | 5 | | | | 1.38 | | | |

#### Continental Prices, f.o.b. Continental Ports

*Per Metric Ton, Gold £ at $4.86*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Billets, Thomas | £2 | 10s. | | | $12.15 | | | |
| Wire rods, No. 5 B.W.G. | 5 | 5 | | | 25.51 | | | |
| Black sheets, No. 31 gage, Japanese | 11 | 5 | | | 54.68 | | | |
| | | | | | Cents a Lb. | | | |
| Steel bars, merchant | 2 | 16 | to | 2 | 17 | 0.61 | to | 0.62 |
| Beams, Thomas | 2 | 15 | | | 0.60 | | | |
| Angles, Thomas, 4-in. and larger | 2 | 14 | to | 2 | 15 | 0.59 | to | 0.60 |
| Hoops and strip steel over 6-in. base | 3 | 12½ | to | 3 | 15 | 0.81 | to | 0.83 |
| Wire, plain, No. 8 | 5 | 5 | | | 1.12 | | | |
| Wire, barbed, 4-pt., No. 16, B.W.G. | 8 | 10 | | | 1.87 | | | |

Cost about $80,000 with equipment. John M. Tippee, City Hall, city engineer.

**Phillips Petroleum Co.,** 3666 Archer Avenue, Chicago, purchased 2½-acre tract at Niles Center for bulk oil storage and distributing plant. Cost over $70,000 with equipment.

**Maizewood Products Corpn.,** Dubuque, Iowa, manufacturer of wallboard and kindred products, plans rebuilding part of mill recently destroyed by fire. Loss over $100,000 with machinery.

**Century Vitreous Enamel Co.,** 1539 East Fifty-second Street, Chicago, has been organized by Victor H. Rosen and Joseph E. Mudra to manufacture enameled iron products.

**Commercial Solvents Co.,** Peoria, Ill., is resuming operations at local plant, following shut down since last July. About 300 men will be employed.

**City Council,** Dubuque, Iowa, approved bond issue of $150,000 for construction of coal and ore dock, with elevating, conveying, loading and other handling equipment. It will be operated under lease by Kanawha-Mississippi Coal Co.

**Catholic Boys' Trade School,** Lockport, Ill., let general contract to W. J. Lynch Co., 844 Rush Street, Chicago, for airplane hangar at vocational training school, with repair facilities. Cost over $35,000. Joseph W. McCarthy, 221 North La Salle Street, Chicago, architect.

**Common Council,** Milford, Iowa, will take bids soon for municipal electric light and power plant. Bond issue for $80,000 has been authorized.

## ◀ PITTSBURGH ▶

**Heppenstall Forge & Knife Co.,** 4620 Hatfield Street, Pittsburgh, has work under way on addition for production of steel blades for safety razors. Cost over $200,000 with machinery.

**Quaker State Oil Refining Corpn.,** Oil City, Pa., has acquired plant and business of Independent Refining Co., same place, and will consolidate, increasing output.

**Frick-Reid Supply Co.,** 111 Sandusky Street, Pittsburgh, manufacturer of oil well equipment and supplies, plans one-story addition for pipe fabricating shop and storage and distributing service. Cost over $35,000 with equipment.

**Stackpole Carbon Co., Inc.,** St. Mary's, Pa., manufacturer of welding carbon and other carbon products, has merged with Pure Carbon Co., Inc., Wellsville, N. Y., manufacturer of similar specialties. Wellsville plant will be removed to St. Mary's and capacity increased.

**Mayer China Co.,** Beaver Falls, Pa., is arranging for rebuilding brick plant and mold shop destroyed by fire in October. Cost over $40,000 with machinery.

## ◀ DETROIT ▶

**Buick Motor Co.,** Flint, Mich., will resume manufacture of metal bodies at its plant in Canada to start at Oshawa, Ont., where steel stamping department will be reopened.

**Duluth, South Shore & Atlantic Railway Co.,** First National Bank Building, Detroit, and Peoples Motor Car, same city, are low bidders on freight cars at Marquette, Mich. Total is close and can be awarded. Plan to have cars 42 ft. long. Contractors Railway Equipment Co., Detroit, will be awarded contract for steel underframes and will manufacture. Cost about $40,000 with machinery. Fred D. Lewis, Marquette, chief engineer.

**Detroit Steel Products Co.,** 2015 Dix Avenue, Detroit, has been organized by Harry Ferguson and associates to manufacture steel products. Plans are under way for new plant.

**Detroit Gasket & Manufacturing Co.,** 1200 Glastonberry Avenue, Detroit, has been organized by Harry Ferguson and associates to manufacture metal products.

**Board of Public Works,** South Haven, Mich., plans installation of electric-operated pumping equipment, conveying machinery and other mechanical equipment in proposed sewage disposal plant. Cost $150,000.

**Board of Trustees,** Wayne County Training School, Northville, Mich., will take bids on general contract for two-story vocational training school addition. Nathaniel O. Gould, Empire Building, Detroit, architect and engineer.

**Detroit Aircraft Corpn.,** 115 Campau Street, Detroit, will develop subsidiary, Metalclad Airship Corpn., in connection with reorganization now under way, providing new financing in amount of $2,000,000. Five subsidiary interests will be dissolved, Blackburn Aircraft Corpn., Detroit Aircraft Export Corpn., Eastman Aircraft Corpn., Marine Aircraft Corpn., and Gliders, Inc.

**Page Steel & Wire Co.,** Adrian, Mich., subsidiary of American Chain Co., Bridgeport, Conn., has resumed production on full time schedule, following curtailment for several weeks.

**Chromium Plating Corpn.,** Jackson, Mich., is operating at capacity with full working force.

## ◀ GULF STATES ▶

**City Commission,** Austin, Tex., secured title to power dam across Colorado River, near city, and power plant, with adjoining properties, as result of court action. City plans to lease property for 40 years to Austin Dam, Inc., for furnishing electric light and power at Austin and vicinity, with provision that company expend $1,500,000 in expanding and improving power plant and lines.

**Southern States Refining Co.,** 223 Egan Street, Shreveport, La., R. B. Walker, head, contemplates oil refinery on Mooringsport Road, with initial capacity of 1000 bbl. daily. Cost over $150,000 with machinery. Company is building oil storage and distributing plant with capacity about 5000 bbl.

**United States Sugar Co.,** care of Bitting, Inc., 52 Wall Street, New York, recently organized, has purchased plant and properties of Southern Sugar Co., Clewiston, Fla., and other parts of State, at receiver's sale on bid of $900,000. New company, operated under management of Bitting, Inc., will remodel cane sugar mill and plant, resuming production soon.

**East Quarry Co.,** Glenrose, Ala., C. A. East, head, plans installation of conveying and auxiliary equipment at stone quarries.

**Bearon Oil & Refining Co.,** Henderson, Tex., plans rebuilding oil refinery recently destroyed by fire.

**Gulf States Utilities Co.,** Beaumont, Tex., will make extensions and improvements in electric light and power system at St. Martinville, La., including installation of additional equipment.

**Eagle-Lincoln Aircraft Corpn.,** Fairfax Airport, Kansas City, Mo., contemplates airplane plant near Jacksonville or Tampa, including assembling department. Cost over $15,000.

**Central Texas Hydro-Electric Co.,** Austin, Tex., has taken over partially constructed power dam on Colorado River, near Bastrop, Tex., and other properties recently acquired from Lewis Pugh & Rockwood Development Co., 228 South La Salle Street, Chicago. Company will complete dam and power plant, and construct transmission lines to Austin, Bastrop and other points. Cost about $1,000,000 with equipment.

**Texas Power & Light Co.,** Dallas, Tex., has plans under way for new electric power plant at Waco, Tex., to cost about $1,000,000 with equipment.

**Texas Electric Service Co.,** Fort Worth, Tex., has plans under way for new electric power plant at Fort Worth, to cost about $1,000,000 with equipment.

**Texas Power & Light Co.,** Dallas, Tex., has plans under way for new electric power plant at Dallas, to cost about $1,000,000 with equipment.

**Texas Electric Service Co.,** Fort Worth, Tex., has plans under way for new electric power plant at Fort Worth, to

# PLANT EXPANSION AND EQUIPMENT BUYING

## Machine Tool Sales Gained in November

### Upward Trend May Not Be Maintained This Month, But Outlook Is Fair for Increase in January

THE National Machine Tool Builders' Association will report a slight gain in orders in November over October. The increase, small though it was, is regarded as encouraging in view of the fact that the October volume dropped to the lowest point since the 1921 depression. The October index figure was 44.5 and that for November probably will be a little above 50. Whether the November improvement will be continued into December is still uncertain. There were fair orders during the first half of the month, but not much is expected during the remainder of December.

The market is not barren of prospects, but most of the manufacturers who have modernization programs in mind are awaiting definite signs of a turn in the general business situation before going ahead. Some business has been promised for January.

Orders for repair parts have been fairly good, as many plants will take advantage of the year-end shutdowns to recondition shop equipment.

An inquiry for 45 wood-working tools, to cost about $40,000, has been sent out by the War Department for the Air Corps, Dayton, Ohio. Bids will close Jan. 11.

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#### New York

Machine tool sellers are not expecting much business during the remainder of this month, but there are indications that some delayed orders will be placed in January. The machine tool industry's prospects are expected to be good as soon as some definite signs have appeared of a turn in general business. Many inquiries are pending on which action is virtually assured when conditions are ripe for manufacturers to proceed with their modernization plans.

#### Chicago

About the only consolation dealers can derive from this market are a few scattered inquiries which give some promise of orders early in 1932. One inquiry is out for complete equipment used for making metal license plates. Presses, ovens, enameling machinery, number dies, and the like will be needed. The Illinois State Hospital at Manteno will buy a 36-in. band saw, a 16-in. jointer and a spray gun outfit. Most dealers believe that December will be the low month of the year in sales.

#### Cleveland

An inquiry for 45 wood-working tools, aggregating about $40,000, has been sent out by the War Department, Air Corps, Dayton. Bids will close Jan. 11. The machines are for use in various Government air fields in the United States, Panama and Hawaii. Generally, the market continues dull, with orders and inquiries confined to single tools. Very little business is in prospect for the remainder of the month. Contemplated purchases in most cases are expected to be postponed until January.

#### New England

Additional quotations were made on equipment needed by metal-working plants, and the number of prospects now outstanding is greater than at any time this year. That, together with buying of used tools by small shops and maintenance of large shop working schedules despite the holiday season, gives rise to the belief that business will improve with inventories out of the way. New England machine tool builders are securing some business from automobile manufacturers.

#### Milwaukee

Developments the past week point to more active business in the near future. Not only was inquiry considerably better, but increase in actual orders, while not large, was encouraging. Automotive industries account for the greater share of the purchases. Increased activity in shops specializing in tools, dies, jigs and fixtures is believed to be the forerunner of a general improvement in many lines of the metal industry. Payrolls in the first half of December represent a substantial increase over the average for similar periods in any of the past four months.

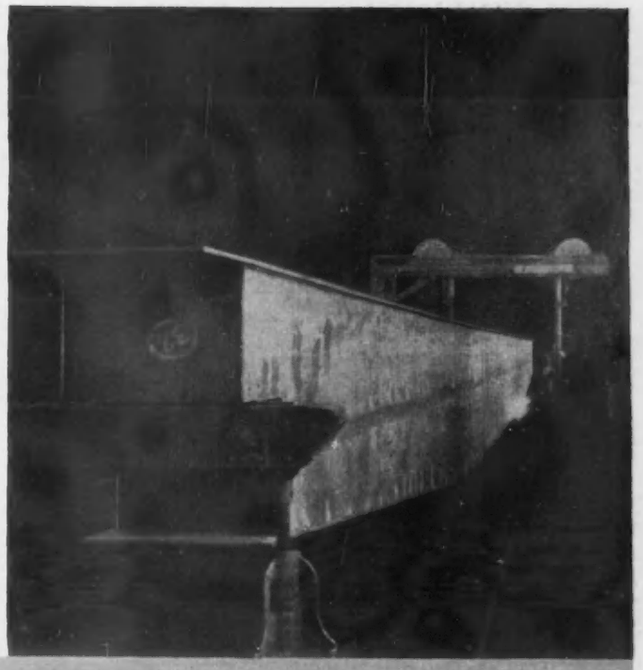
#### Cincinnati

Demand for machine tools continues to be spotty. Lathe bookings, which showed an increase two weeks ago, have declined, while manufacturers of shapers report a slight spurt in business. Inquiry continues to be good, although little tangible results are expected until after Jan. 1. Orders for repair parts continue to reflect interest in reconditioning tool equipment.

#### Pittsburgh

Local dealers are engaged principally in making estimates for possible 1932 equipment purchases. Shop executives are anxious to convince plant managers of the necessity for buying new tools, but appropriations are difficult to obtain. Sales are at a minimum and include practically no items of importance. Many plants are closing for the remainder of the year and are placing orders for repair parts to be used during the suspension period.

CLEVELAND all-welded rolled steel crane . . . bridge girders, end trucks and trolley frame. All bearings are roller bearings. The capacity is 10 tons . . . span of 97 feet. One of an order for five cranes built for West Virginia Rail Co., Huntington, W. Va.



**THE CLEVELAND CRANE & ENGINEERING CO.**
**WICKLIFFE, OHIO**
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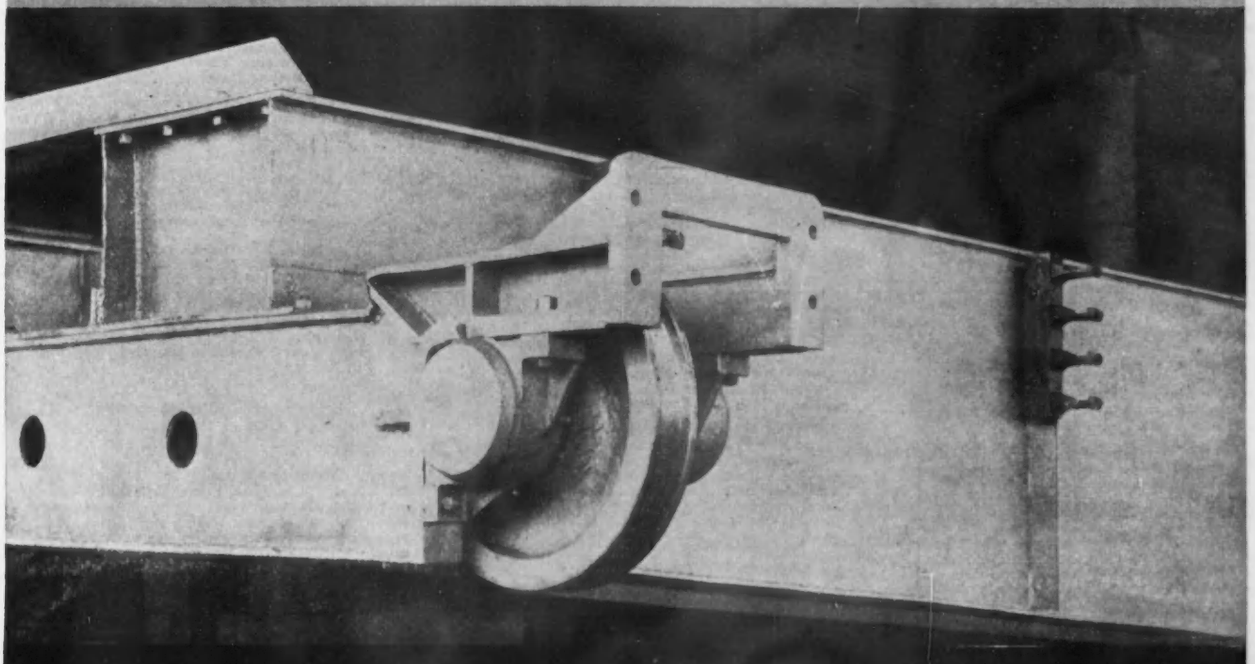


# CLEVELAND CRANES

All Sizes for Every Service

## NEW YORK

**Lenox Roofing & Sheet Metal Works, Inc.,** New York, recently organized, leased factory at 4283-85 Park Avenue, Bronx, with 20,000 sq. ft. floor space, for manufacture of sheet metal building products, air-conditioning equipment, etc.

**R. G. Cory,** 30 Church Street, New York, architect and engineer, has plans for four-story automobile service, repair and garage building, 100 x 120 ft., at 514 West Twenty-third Street. Cost over $100,000 with equipment.

**Army Engineer Supervisor,** New York Harbor, 39 Whitehall Street, New York, asks bids until Jan. 7 for constructing one steel hull, Diesel-driven, patrol boat, 121 ft. long.

**James F. DeQuoy Co., Inc.,** New York, organized by James F. DeQuoy, 242 East Thirty-seventh Street, electrical contractor, and associates, to manufacture electric lighting fixtures and equipment.

**New York Central Lines,** 466 Lexington Avenue, New York, W. C. Bower, vice-president in charge of purchases and stores, asks bids until Dec. 21 for quantity of steel wheels.

**Asco Supply Co.,** Glendale, L. I., steam fitters' supplies, plans one-story pipe shop, storage and distributing building, 100 x 165 ft. Cost over $35,000 with equipment.

**Bureau of Supplies and Accounts,** Navy Department, Washington, asks bids until Jan. 5 for one motor-driven coil-winding machine for Brooklyn Navy Yard; until Dec. 22 for one or two airship mooring winches for naval air station at Lakehurst, N. J.

**Gristede Brothers, Inc.,** 1885 Park Avenue, New York, wholesale grocer, let contract to Barney-Ahlers Construction Corpn., 110 West Fortieth Street, for one-story storage and distributing plant at Mount Vernon, N. Y. Lockwood Greene Engineers, Inc., 100 East Forty-second Street, New York, architect and engineer. Cost over $65,000 with equipment.

**American Machine & Metals, Inc.,** 15 Park Place, New York, is arranging for purchase of Tolhurst Machine Works, Inc., Troy, N. Y., manufacturer of laundry machinery and parts, centrifugals, etc., subsidiary of General Laundry Machinery Corpn., Cincinnati. Purchasing company will consolidate with Troy Laundry Machine Co., Troy, affiliated organization, and increase output.

**Eastern Machine Products Co., Inc.,** Bronx, New York, organized by Charles Zarem, 1117 Manor Avenue and James Grassiano, 65 Glen Street, Brooklyn, to manufacture tools, dies and other mechanical specialties.

**Jersey City Welding & Machine Works,** 394-8 Grand Street, Jersey City, N. J., has plans for two-story factory. Cost about $30,000 with equipment.

**Motologue Advertising Corpn.,** 181 Verona Avenue, Newark, N. J., manufacturer of motion message signs and displays, leased part of building at St. Francis and Ferry Streets for expansion.

**Board of Education,** Lodi, N. J., plans manual training department in new two-story and basement junior and senior high school. Cost about $350,000. Frank Pirrone, 104 Midland Avenue, Garfield, N. J., architect.

**Standard Office Partition Co.,** Irvington, N. J., manufacturer of office partitions, fixturers, etc., leased part of building at 120 Coit Street for expansion.

**Liberty Cork Co.,** Jersey City, N. J., recently organized, leased factory at 44-50 Bostwick Avenue with 15,000 sq. ft. floor space, for manufacture of cork and cork insulation products.

**Charles Shilowitz,** 26 Journal Square, Jersey City, N. J., architect, has revised plans for multi-story automobile service, repair and garage building. Cost over $450,000 with equipment.

**Dooner & Smith Chemical Co.,** 374-82 Mulberry Street, Newark, N. J., manufacturer of industrial chemicals, leased one-story building to be erected at Haynes Avenue and Pennsylvania Railroad, containing 15,000 sq. ft. floor space, for storage and distribution.

**National Elevator Accessories Corpn.,** Newark, care of Griffinger & Griffinger, 31 Clinton Street, attorneys, has been organized by John W. Beck and Louis Herman to manufacture elevator parts and equipment.

**Mount Vernon Die Casting Corpn.,** 118 Pearl Street, Mount Vernon, N. Y., has purchased good will, tools and dies of Republic Die Casting Co., 138 Mott Street, New York.

**Fischer Foundry Corpn.,** Bound Brook, N. J., has acquired business of Fischer-Sweeny Bronze & Aluminum Company, Inc. Operations will be consolidated at plant of Fischer Foundry Corpn.

## SOUTH ATLANTIC

**Joslyn Co.,** Ninth Street and Chesapeake Avenue, Baltimore, manufacturer of electrical equipment and supplies, filed plans for one-story addition, 180 x 253 ft., for storage and distribution. Cost about $40,000 with equipment.

**Anti-Fire Extinguisher Corpn.,** Alexandria, Va., leased space in building of Emerson Engineering Corpn., for manufacture of fire extinguishers, alarms, etc.

**United States Engineer Office,** Navy Department, Washington, asks bids until Dec. 22 for one 2-hp. motor and reduction gear unit (Circular 78).

**Taft, Warren & Taft, Inc.,** 638 West Redwood Street, Baltimore, soda fountains and equipment, leased space at 121 North Greene Street, 25 x 147 ft., and will use in part for storage and distribution.

**Chesapeake & Potomac Telephone Co.,** 5 Light Street, Baltimore, authorized new plant and equipment in city to cost $111,550; also extensions and improvements in plants and system in State, cost $185,000.

**Bureau of Yards and Docks,** Navy Department, Washington, asks bids until Jan. 6 for electric battery overhaul and reconditioning building, substation and acid-mixing plant at submarine repair base, Mare Island, Cal., including electric traveling cranes; also bids (no closing date stated) for three air compressors at destroyer base, San Diego, Cal.

**Monroe Bonded Warehouses,** 175 Spring Street, S. W., Atlanta, Ga., will purchase machinery for new cold storage and refrigerating plant, capacity 100,000 cu. ft.

**General Purchasing Officer,** Panama Canal, Washington, asks bids until Dec. 23 for 10,000 sq. ft. wire cloth, machinist's clamps, Stillson wrenches, hand augur bits, chopping axes, etc. (Schedule 2709); until Dec. 21 for 1228 pressed or tubular steel school desks (Schedule 2707); until Dec. 28 for pipe, tubing, wire rope, cable, electric motors, storage batteries, air compressor, cable terminals, and other equipment and supplies (Schedule 2708).

**Colonial Ice Cream Co.,** 622 Pennsylvania Avenue, N. W., Washington, has plans for two-story ice cream and refrigerating plant, with power house designed for oil-burning equipment. Cost about $100,000 with machinery.

**Augusta Canal Commission,** Augusta, Ga., plans call for bids early in February on general contract for first unit of electric light and power project, including Diesel engines, generators and auxiliaries for capacity of 15,000 hp. Bonds for $2,500,000 have been approved for complete project. Burns & McDonnell Engineering Co., Interstate Building, Kansas City, Mo., consulting engineer.

**Bureau of Supplies and Accounts,** Navy Department, Washington, asks bids until Jan. 5 for motor-driven crank shaper for New York or San Francisco yards; also one motor-driven shaper for same yards; and 10,000 1-gal. tin cans for Norfolk Navy Yard; until Dec. 22 for motor-generator sets for different yards.

## PHILADELPHIA

**Philadelphia Electric Co.,** Tenth and Chestnut Streets, Philadelphia, has acquired plant and property of Parkesburg Gas Co., operating at Parkesburg, Atglen, Valley and other points in Chester County. Expansion is planned.

**Rapidryer Mfg. Co.,** Penn Street and Miller Avenue, Bryn Mawr, Pa., has been organized by Nathan Birdman, 1951 East Moyamensing Avenue, Philadelphia, and H. S. Basow, Haverford Road, Bryn Mawr, to manufacture mechanical drying equipment and parts.

**Bureau of Supplies and Accounts,** Navy Department, Washington, asks bids until Jan. 5 for one motor-driven heavy duty shaper (Schedule 7071), one power press brake (Schedule 7066), and one motor-driven face grinding machine (Schedule 7075) for Philadelphia Navy Yard.

**Latrobe Tool Co.,** 512 Arch Street, Philadelphia, manufacturer of drills, etc., with factory at Latrobe, Pa., leased floor at 32 North Fifth Street for local branch.

**Midland Tube & Pipe Co.,** Trenton, N. J., has been organized by Arthur Karno, Broad Street Bank Building, Trenton, and George J. Herold, Jr., 124 Lake Avenue, Metuchen, N. J., capital $50,000, to manufacture steel tubing, pipe, etc.

**Safe Harbor Power Co.,** Lexington Building, Baltimore, affiliated with Consolidated Gas, Electric Light & Power Co., same address, will increase capacity of first section of hydroelectric generating plant at Safe Harbor, Pa., with additional generating units, developing gross output of 510,000 hp., as compared with initial capacity of 255,000 hp.

**Boyertown Burial Casket Co.,** Boyertown, Pa., plans two-story branch, with service and garage unit, in Bronx, New York. Cost $75,000. Pruitt & Brown, 342 Madison Avenue, New York, architects.

**Marcus Shotz,** Philadelphia, has leased two-story factory, 60 x 120 ft., at 1918-22 Germantown Avenue, for manufacture of lighting equipment.

**Naval Aircraft Factory,** United States Navy Yard, Philadelphia, asks bids until Dec. 21 for 20 strut assemblies, 15,000 brass clinch type fasteners, and 6000 steel parachute D rings.

**Pusey & Jones,** Wilmington, Del., manufacturers of heavy machinery, are increasing production and recalled about 100 men. About 200 additional workers will be added to force by Jan. 1.

## BUFFALO

**Doehler Die Casting Co.,** Batavia, N. Y., will carry out expansion, including installation of 30 die-casting machines and auxiliary equipment, making battery of 75 such units at plant. Will increase output for automobile die-castings.

**Syracuse Lighting Co.,** Syracuse, N. Y., subsidiary of Niagara Hudson Power Corpn., Buffalo, contracted with Lycoming Natural Gas Co., Wayne, N. Y., an interest of Standard Oil Co. of New Jersey, 26 Broadway, New York, to furnish natural gas, and will arrange storage, mixing plant, pipe lines, etc., for local distribution.

**Octagon Syndicate, Inc.,** Jamestown, N. Y., has been organized by Andrew Venman, 707 Buffalo Street, and associates to manufacture metal products.

**Lowville Gas Co.,** Lowville, N. Y., has plans for municipal natural gas plant and system. Cost over $85,000. Johnson Church & Co., 149 Broadway, New York, engineers.

**Buffalo General Electric Co.,** Electric Building, Buffalo, plans power substation and addition to power substation at Lackawanna, N. Y. Cost over $75,000 with equipment.

**Olean Metal Cabinet Works, Inc.,** Olean, N. Y., will resume production after shut down since September. Close to normal working force will be employed.

## MILWAUKEE

**Badger Meter Mfg. Co.,** 2357 North Thirtieth Street, Milwaukee, is completing installation of $50,000 worth of equipment for new division manufacturing meters for filling station pumps and similar requirements, as addition to production of domestic and industrial water meters.

**Felker Bros. Mfg. Co.,** Marshfield Wis., manufacturer of culverts, well curbing, tanks and other sheet and plate products, has broken ground for one-story shop extension, 60 x 100 ft., using own labor for erection to maintain full payroll through winter.

**Midwest Die Casting Co.,** 3930 North First Street, Milwaukee, has placed contracts for a shop addition, 25 x 35 ft.

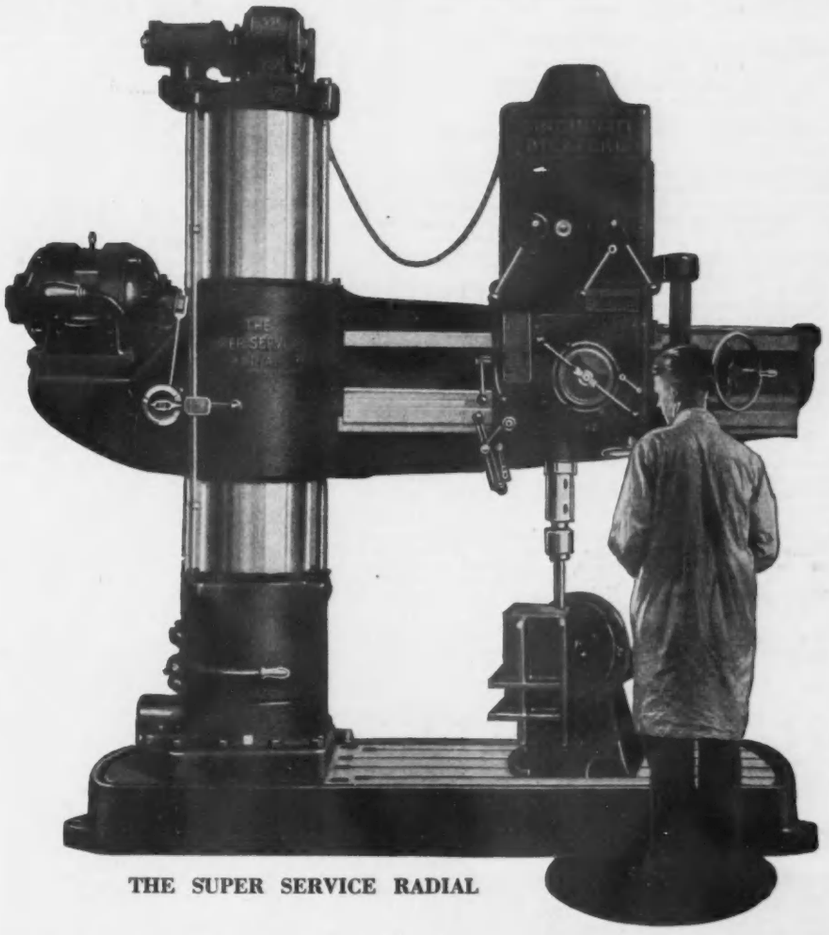
**Beloit Iron Works,** 815 Second Street, Beloit, Wis., has placed general contract with Cunningham Brothers, 648 Third Street, local, for two-story pattern shop extension, 60 x 150 feet. Cost about $35,000 complete.

**Manitowoc County Board,** Manitowoc, Wis., has approved appropriation of $40,000 for erection and equipment of machine shop and repair and storage warehouse, 70 x 300 ft., for County highway commissioner.

**Badger Iron & Wire Works,** 2933 West Cleveland Avenue, Milwaukee, has acquired all assets of Wisconsin Art Bronze & Iron Co., 247 East Keefe Avenue, and will consolidate operations in Badger plant. W. C. Schmeling, president of Wisconsin company, will be general manager of Badger company, and other executives become associated with merged industries. Albert Haeger is president.

# Drilling Costs Cut 50%

## WITH THE SUPER SERVICE RADIAL



THE SUPER SERVICE RADIAL

The Super Service Radial reduces drilling costs because of its many "Long Life—High Production" features. Centralized control at the head is one of the most important, because generally in radial drill operations more time is required for handling and getting ready to drill than in actual cutting. Therefore, the SUPER SERVICE Radial is designed so that every movement required of the operator may be made in the least time and with least effort. He can make every change of speed or feed, and unclamp or clamp the column without moving from his position at the spindle.

## Operating Costs Reduced 50%

"We are using every feature of this machine in our daily production, and operating costs have been reduced as much as fifty per cent on standard operations.

"The performance of the 'Super Service' machine is so far superior to the standard radial drill that we will not hesitate to install additional radials of this type in the future."

**THE CINCINNATI BICKFORD TOOL COMPANY**

**OAKLEY, CINCINNATI, OHIO**

## ST. LOUIS

**City Council,** St. Charles, Mo., has surveys under way for a municipal electric light and power plant. Cost over $200,000 with equipment. Russell & Axon, 6200 Easton Avenue, St. Louis, consulting engineers.

**Board of Education,** Kansas City, Mo., plans manual training department in four-story and basement addition to East High School, 152 x 225 ft. General contract let to Interstate Construction Co., Walsix Building. Cost about $400,000. Charles A. Smith, Finance Building, architect.

**Sieloff Packing Co.,** Newstead and Natural Bridge Avenues, St. Louis, meat packer, plans three-story addition, 80 x 175 ft., including improvements in present plant, and one-story condenser building, 75 x 80 ft. Cost over $65,000 with equipment. Wedemeyer & Nelson, Wainwright Building, architects.

**Anchor Mfg. Co.,** South Kimbrough Street, Springfield, Mo., manufacturer of incubators, window display fixtures, etc., authorized rebuilding of plant recently destroyed by fire. Loss about $70,000 with equipment.

**United States Engineer Office,** Kansas City, Mo., asks bids until Dec. 22 for one automatic boiler feed pump with receiver (Circular 248), for installation of pumping equipment, boiler, piping, etc., and for oil storage system at Napoleon, Mo. (Circular 247).

**City Council,** Oklahoma City, Okla., plans new call for bids for hangar, 120 x 120 ft., with repair and reconditioning facilities at municipal airport. L. M. Bush, city engineer.

**Western Service Co. of Oklahoma, Inc.,** Braniff Building, Oklahoma City, Okla., will take over system of Oklahoma Natural Gas Corpn., at Shawnee, Okla., and remodel for conversion from high to low pressure operation. Natural gas furnished at city limits by Oklahoma company.

**City Council, Enid, Okla.,** plans installation of electric-operated pumping equipment in connection with extensions and improvements in municipal waterworks. Bond issue of $250,000 is being arranged.

**St. Louis Steel Products Co.,** St. Louis, has been organized by Gayle R. Hermann, Webster Groves, Mo., and associates, to manufacture iron and steel specialties.

**Metropolitan Utilities District,** Harney and Eighteenth Streets, Omaha, Neb., plans extensions and improvements in artificial gas plant and system. Cost over $100,000.

**Harlan & Harlan Machine Works,** 308 Broadway, Kansas City, Mo., contemplates purchase of electric generator unit, d.c. type, 125 to 175 kw. rating.

**Missouri Pacific Railroad Co.,** St. Louis, reopened shops at North Little Rock, Ark., following suspension since Oct. 28. Employment will be given to about 1200 men.

**Metalcraft Corpn.,** 5101 Penrose Avenue, St. Louis, has leased 5000 additional sq. ft. of space for storage at 4204 North Union Boulevard.

**St. Louis Meter & Pump Co.,** C. C. Fredericks, president, has established new plant at Cairo, Ill., for manufacture of "St. Louis" gasoline merchandising units.

**Motor Electric Service Co.,** 3912 Washington Avenue, St. Louis, plans erection of one-story and basement building, containing about 4500 sq. ft. of floor space, for increased facilities.

## CLEVELAND

**Midland Steel Products Co.,** Madison Avenue and West 106th Street, Cleveland, manufacturer of automobile stampings, pressed steel parts, etc., has expansion program under way, including additional equipment for production of new automobile axle housing. Cost over $100,000.

**City Council,** Shelby, Ohio, plans additions and improvements in municipal electric light and power house, including new equipment. Bond issue of $85,000 approved. Boyd Wierman, city engineer.

**Standard Steel Fabricating Co.,** Euclid Village, Ohio, care of Bartholomew, Leeper & Griswold, Standard Bank Building, Cleveland attorneys, has been organized by Carl J. Black and Allan F. Paton to manufacture steel products.

**City Council,** Galion, Ohio, plans extensions and improvements in municipal electric light and power house, including new boiler department and equipment. Cost over $150,000 with machinery. Hadlow, Hughes, Hick & Conrad, Inc., 850 Euclid Avenue, Cleveland, consulting engineers.

**Ohio Edison Co.,** Akron and Springfield, Ohio, has acquired property of Western Reserve Power & Light Co., Medina, Ohio, and vicinity. Transmission lines and power substation for service from Akron power plant are planned. Cost about $100,000 with equipment.

**American Shipbuilding Co.,** Cleveland, authorized resumption of operations in different divisions of plant and will add about 1000 men to working force by Jan. 1.

**Cleveland Pneumatic Tool Co.,** Cleveland, has received an order through Amtorg Trading Corpn., for 18 special riveting machines, with auxiliary equipment, for Soviet automobile plant at Nizhni Novgorod, Russia.

## NEW ENGLAND

**W. W. Cross & Co., Inc.,** Brockton, Mass., manufacturer of tacks, nails, etc., has consolidated with Granite State Tack Co., East Jaffrey, N. H., manufacturer of kindred products. Brockton plant will be removed to last noted place.

**Warwick Gas Co.,** West Warwick, R. I., contemplates addition to artificial gas plant and system. Cost over $50,000 with equipment. Johnson Church & Co., 149 Broadway, New York, engineers.

**State Water Commission,** State Office Building, Hartford, Conn., asks bids until Dec. 21 for 100,000-gal. elevated steel tank and tower, hemispherical bottom, at Laurel Heights Sanatorium, Shelton, Conn. Henri B. Van Zelm, 11 Asylum Street, Hartford, consulting engineer.

**Waltham Horological Mfg. Co.,** Waltham, Mass., has been organized by Eugene C. and Eugene H. Swain, 1 Spruce Street, to manufacture precision machinery and parts.

**Atlas Bronze & Aluminum Co.,** West Springfield, Mass., recently organized, will operate at local foundry of Cogswell Mfg. Co., for production of brass, bronze, aluminum and other metal castings. P. P. Galaski, formerly connected with Bristol Brass Corpn., Bristol, Conn., is head.

**City Council,** Holyoke, Mass., is considering incinerator plant, with conveying, unloading and other equipment. Cost about $75,000.

**Palmer Steel Co.,** Main Street, Springfield, Mass., plans one-story works at Chicopee, Mass., 60 x 360 ft. Cost over $75,000 with equipment.

**School Board,** Greenwich, Conn., contemplates installation of manual training department in addition to Byram High School. Cost about $325,000. Coffin & Coffin, 522 Fifth Avenue, New York, architects.

**Board of Education,** Warwick, R. I, is considering manual training department in new junior and senior high school at Lakewood. Appropriation of $425,000 has been made. William R. Walker & Son, 49 Weybosset Street, Providence, R. I., architects.

**Wilmington Packing Co.,** New Boston Street, Woburn, Mass., food products, has plans for one-story canning plant addition. Cost over $40,000 with equipment.

**General Electric Co.'s** transformer division, Erie works, will be temporarily transferred to Pittsfield, Mass., to aid in relieving unemployment and to facilitate production of certain lines. Erie plant is busy on locomotive work.

## CHICAGO

**Curtis Piston Ring Co.,** Chicago, has been organized by Charles Curtis and Jerry C. Allen, to take over and expand company of same name at 2409 North Crawford Avenue, manufacturer of piston rings and kindred products.

**Stewart Warner Corpn.,** 1828 Diversey Parkway, Chicago, manufacturer of speedometers, parts, etc., is adding to line of automotive equipment with new mechanical four-wheel power brake system and will increase output for specialty.

**City Councils,** Johnstown and Milliken, Colo., plan joint municipal electric light and power plant about midway between two places. Cost over $45,000 with equipment.

**City Council,** Des Moines, Iowa, has acquired land at S. W. Twenty-first Street and Army Post Road for municipal airport, with hangar, repair shop and other field units.


# Typewritten Communication By Telephone or Telegraph

## Now Possible Between Distant Offices

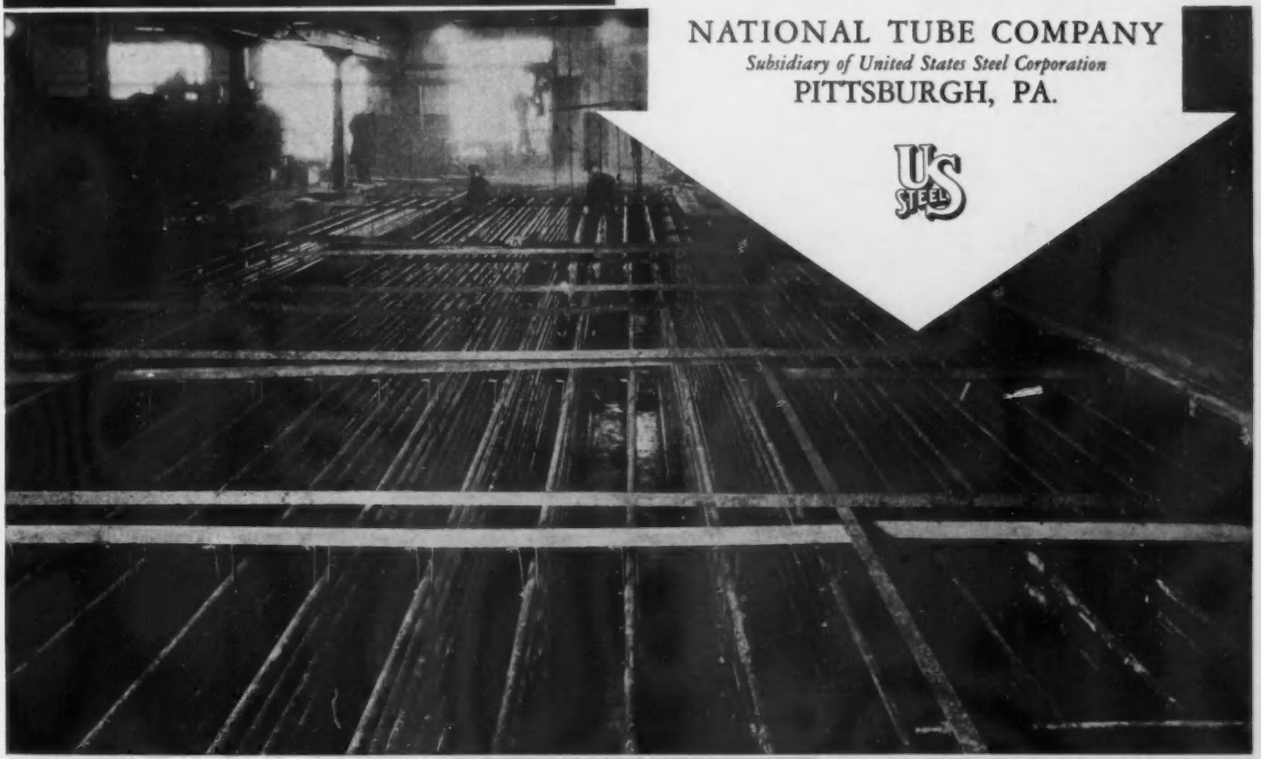
INQUIRY and immediate reply is made possible by the Bell system's new teletypewriter service, which enables instant, two-way typewritten communication between subscribers in any part of the United States. The teletypewriter machine illustrated has a standard keyboard and can be mastered easily by competent typists. The Western Union and Postal telegraph companies are installing competitive systems similarly operated.

# "In remodeling ...we used all of the original pipe"

IT was in September, 1915, that the Columbia Ice Company of Pittsburgh, installed 40,000 feet of 1¼-inch NATIONAL Pipe in their tanks.

The sixteen years that have passed in which the pipe was in continuous service, have abundantly justified their choice. For never once has trouble arisen from any deterioration of the pipe, notwithstanding the severity of the service involved; and lately when all of it had to be removed because an entirely new system had been decided on, careful inspection revealed that the material was in excellent condition. All of the original pipe was again put into service, thus confirming once more the reason why NATIONAL is—

*America's Preferred Pipe for Refrigeration*



NATIONAL TUBE COMPANY
*Subsidiary of United States Steel Corporation*
PITTSBURGH, PA.

U S STEEL

# NATIONAL PIPE

Cost about $80,000 with equipment. John M. Tippee, City Hall, city engineer.

**Phillips Petroleum Co.,** 3666 Archer Avenue, Chicago, purchased 2½-acre tract at Niles Center for bulk oil storage and distributing plant. Cost over $70,000 with equipment.

**Maizewood Products Corpn.,** Dubuque, Iowa, manufacturer of wallboard and kindred products, plans rebuilding part of mill recently destroyed by fire. Loss over $100,000 with machinery.

**Century Vitreous Enamel Co.,** 1539 East Fifty-second Street, Chicago, has been organized by Victor H. Rosen and Joseph E. Mudra to manufacture enameled iron products.

**Commercial Solvents Co.,** Peoria, Ill., is resuming operations at local plant, following shut down since last July. About 300 men will be employed.

**City Council,** Dubuque, Iowa, approved bond issue of $150,000 for construction of coal and ore dock, with elevating, conveying, loading and other handling equipment. It will be operated under lease by Kanawha-Mississippi Coal Co.

**Catholic Boys' Trade School,** Lockport, Ill., let general contract to W. J. Lynch Co., 844 Rush Street, Chicago, for airplane hangar at vocational training school, with repair facilities. Cost over $35,000. Joseph W. McCarthy, 221 North La Salle Street, Chicago, architect.

**Common Council,** Milford, Iowa, will take bids soon for municipal electric light and power plant. Bond issue for $80,000 has been authorized.

## PITTSBURGH

**Heppenstall Forge & Knife Co.,** 4620 Hatfield Street, Pittsburgh, has work under way on addition for production of steel blades for safety razors. Cost over $200,000 with machinery.

**Quaker State Oil Refining Corpn.,** Oil City, Pa., has acquired plant and business of Independent Refining Co., same place, and will consolidate, increasing output.

**Frick-Reid Supply Co.,** 111 Sandusky Street, Pittsburgh, manufacturer of oil well equipment and supplies, plans one-story addition for pipe fabricating shop and storage and distributing service. Cost over $45,000 with equipment.

**Stackpole Carbon Co., Inc.,** St. Mary's, Pa., manufacturer of welding carbon and other carbon products, has merged with Pure Carbon Co., Inc., Wellsville, N. Y., manufacturer of similar specialties. Wellsville plant will be removed to St. Mary's and capacity increased.

**Mayer China Co.,** Beaver Falls, Pa., is arranging for rebuilding power plant and mold shop destroyed by fire in October. Cost over $85,000 with machinery.

## DETROIT

**Buick Motor Co.,** Flint, Mich., will transfer manufacture of metal bodies for cars for Canada to plant at Oshawa, Ont., where sheet metal department will be increased.

**Duluth, South Shore & Atlantic Railway Co.,** First National Bank Building, Detroit, and Duluth, Minn., has work under way on new iron ore loading dock at Marquette, Mich., 3546 ft. long, with ore bin section 1108 ft. long and 85 ft. high. Conveying, hoisting, loading and other equipment will be installed. Cost $2,000,000 with machinery. Unit is scheduled to be placed in service next spring.

**Superintendent of Lighthouses,** 3760 East Jefferson Street, Detroit, asks bids until Dec. 22 for Scotch marine boiler for lighthouse tender.

**Lincoln Motor Co.,** 6200 West Warren Street, Detroit, is increasing production for new 12-cylinder model and giving employment to 2800 men.

**City Council,** Lexington, Mich., plans installation of electric-operated pumping machinery in connection with extensions and improvements in municipal waterworks. Cost about $25,000. Francis Engineering Co., Saginaw, Mich., engineer.

**Board of Education,** St. Johns, Mich., contemplates manual training department in new multi-story high and grade school. Cost over $175,000. R. V. Gay, St. Johns, architect.

**Ford Motor Co.,** Dearborn, Mich., has acquired limestone properties in Chippewa and Mackinac counties and will develop for limestone flux for blast furnace at Gladstone, Mich.

**Metal-Tite Products, Inc.,** 6553 Woodward Street, Detroit, has been organized by Robert A. Mooney and Harry D. Robertson, 14653 Glastonberry Avenue, to manufacture metal products.

**Board of Public Works,** South Haven, Mich., plans installation of electric-operated pumping equipment, conveying machinery and other mechanical equipment in proposed sewage disposal plant. Cost $150,000.

**Board of Trustees,** Wayne County Training School, Northville, Mich., will take bids on general contract for two-story vocational training school addition. Nathaniel O. Gould, Empire Building, Detroit, architect and engineer.

**Detroit Aircraft Corpn.,** 115 Campau Street, Detroit, will develop subsidiary, Metalclad Airship Corpn., in connection with reorganization now under way, providing new financing in amount of $2,000,000. Five subsidiary interests will be dissolved, Blackburn Aircraft Corpn., Detroit Aircraft Export Corpn., Eastman Aircraft Corpn., Marine Aircraft Corpn., and Gliders, Inc.

**Page Steel & Wire Co.,** Adrian, Mich., subsidiary of American Chain Co., Bridgeport, Conn., has resumed production on full time schedule, following curtailment for several weeks.

**Chromium Plating Corpn.,** Jackson, Mich., is operating at capacity with full working force.

## GULF STATES

**City Commission,** Austin, Tex., secured title to power dam across Colorado River, near city, and power plant, with adjoining properties, as result of court action. City plans to lease property for 40 years to Austin Dam, Inc., for furnishing electric light and power at Austin and vicinity, with provision that company expend $1,500,000 in expanding and improving power plant and lines.

**Southern States Refining Co.,** 223 Egan Street, Shreveport, La., R. B. Walker, head, contemplates oil refinery on Mooringsport Road, with initial capacity of 1000 bbl. daily. Cost over $150,000 with machinery. Company is building oil storage and distributing plant with capacity about 5000 bbl.

**United States Sugar Co.,** care of Bitting, Inc., 52 Wall Street, New York, recently organized, has purchased plant and properties of Southern Sugar Co., Clewiston, Fla., and other parts of State, at receiver's sale on bid of $900,000. New company, operated under management of Bitting, Inc., will remodel cane sugar mill and plant, resuming production soon.

**East Quarry Co.,** Glencoe, Ala., C. A. East, head, plans installation of conveying and auxiliary equipment at stone quarries.

**Beacon Oil & Refining Co.,** Henderson, Tex., plans rebuilding oil refinery recently destroyed by fire.

**Gulf States Utilities Co.,** Beaumont, Tex., will make extensions and improvements in electric light and power system at St. Martinville, La., including installation of additional equipment.

**Eagle-Lincoln Aircraft Corpn.,** Fairfax Airport, Kansas City, Mo., contemplates airplane plant near Jacksonville or Tampa, including parts and assembling departments. Cost over $45,000.

**Central Texas Hydro-Electric Co.,** Seguin, Tex., has taken over partially constructed power dam on Colorado River, near Burnet, Tex., and other properties recently acquired from Emery, Peck & Rockwood Development Co., 208 South La Salle Street, Chicago. Central company will complete power dam and build hydroelectric generating plant and transmission system. It also has sites for other power developments on same river. Cost over $3,000,000 with machinery.

**Continental Chemical Co.,** Burt Building, Dallas, Tex., manufacturer of industrial chemicals, plans works at Tahoka, Tex., with power house and other mechanical departments. Cost over $500,000 with equipment.

**Common Council,** Palestine, Tex., has acquired over 200 acres for municipal airport. Hangar, with repair and reconditioning shop, and other field units are planned.

## CINCINNATI

**City Council,** Lebanon, Ohio, plans extensions and improvements in municipal electric light and power plant. Cost about $25,000.

**Southern Bell Telephone Co.,** Louisville, has authorized expansion and improvements in plants and system during 1932. Cost about $4,000,000.

**D. A. Ebinger Sanitary Mfg. Co.,** Aden and Smith Streets, Columbus, Ohio, manufacturer of lavatories, fountains, etc., secured contract from Domestic Industries, Inc., Toledo, Ohio, for 35,000 to 50,000 refrigeration boxes for new electric refrigerators to be marketed by Domestic company, and will arrange production facilities for heavy output. Mechanical parts for refrigerators will be manufactured at Dayton, Ohio.

**Contracting Officer,** Wright Field, Dayton, Ohio, asks bids until Dec. 21 for hub assembly propellers (Circular 244), quantity of tube assemblies complete with ignition cables and attaching clamps (Circular 238), and for 1525 engine ring cowl support brackets (Circular 234).

**Frisbie Engine & Machine Co.,** Cincinnati, has been organized by Fred W. and William H. Hartweg, capital $50,000, to take over and expand Frisbie Engine & Machine Works, 35 East Water Street, manufacturer of stationary engine equipment, machinery and parts.

**Kentucky Utilities Co.,** Louisville, plans construction of transmission lines in different parts of Bath County, with power substation facilities.

**United States Engineer Office,** Memphis, Tenn., asks bids until Dec. 28 for quantity of steel castings.

**Kentucky Ignition Co.,** 233 East Main Street, Lexington, Ky., manufacturer of ignition equipment for automobile service, leased two-story building, 70 x 140 ft., to be erected by Edwin C. Gilson, 640 East Main Street, at Ross and Vine Streets, and will use for new plant. Miller & Gratz, Inc., 131 North Lime Street, architect.

**Board of Education,** Eighth and Chestnut Streets, Louisville, plans manual training department in new multi-story junior and senior high school vicinity of First and Second Streets. Cost about $900,000. Call bids on general contract early in 1932. J. Meyrick Colley, 1814 South First Street, architect.

**Crosley Radio Corpn.,** 1319 Arlington Street, Cincinnati, manufacturer of radio equipment and sets, advanced operations to capacity day and night basis with full working forces.

**Desmond-Stephan Mfg. Co.,** Urbana, Ohio, maker of grinding wheel dressers and cutters, has taken over manufacture and sale of machinist and utility vises, made formerly by Simplex Corpn., Woonsocket, R. I.

## INDIANA

**Indiana Steel & Wire Co.,** 700 South Council Street, Muncie, awarded general contract to Albert Glaser, 610 South Jefferson Street, for one-story addition, 60 x 280 ft. for storage and distribution. Cost about $40,000 with equipment.

**Insley Mfg. Co.,** 801 North Olney Street, Indianapolis, manufacturer of contractors' equipment, heavy machinery, etc., has withdrawn from National Equipment Corpn., North Thirtieth Street, Milwaukee, and will be operated as independent company in future.

**Servel, Inc.,** Morton Avenue, Evansville, manufacturer of gas-operated refrigerating equipment, parts, etc., let general contract to M. J. Hoffman Construction Co., Central Union Bank Building, for one-story and basement addition. Cost over $30,000 with equipment.

**Oldenburg Electric Light & Power Co.,** Oldenburg, has been organized to take over and expand Oldenburg Electric Light, Power & Water Works Co., operating power plant and system.

**Illinois Carton & Label Co.,** 2601 North Crawford Avenue, Chicago, manufacturer of corrugated and other cardboard boxes and containers, let general contract to Kistner & Son, 914 South Main Street, Elkhart, for one-story plant at Elkhart, 130 x 200 ft. Cost about $60,000 with machinery.

## PACIFIC COAST

**Board of City Directors,** Pasadena, Cal., authorized plans for municipal storage, distributing and repair plant, consisting of four one-story buildings for machine shop, repair and service shop, oil storage and distributing plant, general equipment storage and distributing unit. Cost about $100,000 with equipment. Marston & Maybury, 25 South Euclid Avenue, architects.

**Los Angeles Soap Co.,** 617 East First Street, Los Angeles, let general contract to Schuck Construction Co., 1937 West Sixty-second Street, for one-story and basement addition, 140 x 268 ft. Cost about $90,000 with machinery. Morgan, Walls & Clements, Van Nuys Building, architects.

**Quartermaster Supply Officer,** Fort Mason, San Francisco, asks bids until Jan. 4 for twist drills, hacksaw blades, machine bolts, breast drills, claw hammers, cotter pins, rivets, cap

## IMAGINE . . .
## a Tool Steel That Will Stand This!

A *disc* of metallic tin is fed into the die . . . the punch descends with all the pressure of a 100-ton Bliss Toggle Press. There is a small annular space between the die and punch . . . through this space the tin is cold extruded around the punch . . . and presto! *you have a toothpaste tube!*

And a TOUGH CARBON TOOL STEEL is doing this job!

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## Business as Others See It

**Digest of Current Financial and Economic Opinion**

A YEAR from now "industrial production, railroad loadings and factory employment will be recorded in greater volumes than at present." So said Col. Leonard P. Ayres in his annual address to the Cleveland Chamber of Commerce. "Gold exports will probably be smaller, money in circulation less and bank failures fewer."

But—"Commercial failures probably will be more numerous. Dividend payments are likely to be less, and the cost of living and average earnings of industrial and railroad employees lower. Likely to advance are brokers' loans and production of electric power."

Political and psychological factors are blamed by Silberling for continuance of the depression. "The late credit pinch does not fairly reflect the *general* economic and industrial position of this country." Germany and our railroads are coupled, by this analyst, in that in both cases the implicit faith in their soundness as investments "has been thoroughly shaken because of a common difficulty—the difficulty of preserving and developing the earning power necessary to assure service on those debts."

As to the railroads, "political interference did much to create the excessive mass of funded debt through impairing earning power by control of rates so that financing by means of stock has for years been well-nigh impossible. Political interference again has stood in the way of readjusting costs and income by insisting that wage *rates* are inviolable," etc.

*Annalist* argues that receiverships are not an unmixed curse. In 1893, it is said, 156 railroads went through that course and "out of that drastic reorganization have emerged several of the soundest systems in the country. . . . Receiverships are a pretty sure means for reducing overcapitalization, for restoring efficient management and for getting inadequately managed corporations on a realistic basis. Also, they can deal adequately with wage questions, which now muddy politics."

President Hoover's annual and budget messages are thus discussed by C. F. Hughes in New York *Times:* "Their effect on sentiment was obviously disheartening, probably because it became so much clearer how the steps to meet the huge budget deficits would hit each individual. Trade expects to see further economies practiced by those who fear higher taxation."

Retail trade in 11 months is reported by the *Times* as off 11 per cent in dollars for department stores and 3½ per cent for chain stores—both "considerably less than the reduction in [unit] prices for the year." Five causes are listed which may contribute to a firming up of commodity prices:

Advances authorized in freight rates are being introduced at once into costs of the materials affected.

Announcement of higher taxation will lead to the figuring of higher costs.

Operation of the bankers' pool reduces the pressure for commodity liquidation.

Hoover plans for finance and home-loan corporations, additional aid to land banks and broadening credit base of Federal Reserve System would have similar effects.

Less hoarding of currency and a gold inflow will enlarge the credit base and encourage freer loans.

After holding within a narrow range (99.9 to 102.6) for seven months, prices have now, *Annalist* says, broken a full point below that range. This price situation causes Theodore H. Price, in *Commerce and Finance*, to remark: "If the price level of either securities or commodities were to remain as it is at present for any great length of time America would be bankrupt and the rest of the world would be mendicant."

screws, lag screws, anchor shackles, wire hoop staples, engineers' wrenches, and other supplies (Circular 123).

**Oil Well Mfg. Corpn.**, Huntington Park, Cal., has been organized by Clarence and R. E. White, Los Angeles, capital $500,000, to take over and expand Oil Well Mfg. Co., 6040 South Alameda Street, manufacturer of oil well drilling equipment and supplies.

**Pacific Gas & Electric Co.**, 245 Market Street, San Francisco, plans equipment storage and distributing plants, with machine and repair facilities, at Hayward, Concord and Colusa, Cal. Cost about $40,000 each, with equipment.

**Bureau of Supplies and Accounts**, Navy Department, Washington, asks bids until Jan. 5 for five 2-ton chain hoists, one 8-ft. and four 18-ft. lifts, and 5000 lb. seamless copper tubing for Mare Island Navy Yard; also for three motor-driven radial drilling machines and one motor-driven heavy-duty vertical milling machine for Puget Sound Navy Yard.

**Cecil Cavanaugh Lumber Co.**, 1423 Puyallup Avenue, Tacoma, Wash., plans installation of traveling crane in connection with rebuilding mill and cabinet shop, destroyed by fire several weeks ago. Cost over $40,000 with equipment.

**Great Northern Railroad Co.**, Fourth and Union Streets, Seattle, let general contract to A. Guthrie & Co., Sherlock Boulevard, Portland, for engine house and repair shops at Bieber, Lassen County, Cal.

**Duarte-Monrovia Citrus Association**, Duarte, Cal., will begin superstructure for one-story and basement packing plant, 90 x 125 ft., with conveying, loading and other equipment, and steam power house. Cost about $40,000 complete. Grant & Brunner, Inc., Ferguson Building, Los Angeles, engineer.

**State Department of Public Works**, Sacramento, Cal., asked bids on general contract for equipment storage and maintenance buildings near Mount Shasta City, including forge and blacksmith shop and other units. Cost over $50,000 with equipment. District engineer, Division of Highways, Redding, Cal., in charge.

**United Tank & Welding Co.**, Los Angeles, has been organized by Ernest L. Riley and F. Murrin Jackson to take over and expand United Tank & Welding Works, 708 North Date Street, manufacturer of steel tanks and other plate products.

### CANADA

**Happy Thought Foundry Co.**, Brantford, Ont., subsidiary of General Steel Wares, Ltd., will be moved to McClary plant at London, Ont., where its line of stoves, ranges, etc., will be continued.

**London Rolling Mills**, London, Ont., will reopen its plant immediately. Company is now controlled by Ingersoll Machine Tool Co., and John Morrow Screw & Nut Co.

**Niagara Brand Spray Co., Ltd.**, Burlington, Ont., manufacturer of fruit spraying equipment, etc., will build a new plant. Cost about $50,000.

**Costello Shank Co. of Canada, Ltd.**, manufacturer of shoe fittings, etc., is establishing a plant in building formerly occupied by Wright Flexible Axle Co., Montreal East, Que.

**Iver Johnson Arms & Cycle Works of Canada, Ltd.**, a subsidiary of a Fitchburg, Mass., company, is installing equipment in building at Cobourg, Ont., formerly occupied by H. W. Cooey Machine & Arms Co. Plant will be in operation early next year.

**W. & R. Walsh, Ltd.**, Chatham, N. B., will build a wood-working factory to replace one recently destroyed by fire. Cost about $50,000.

**Brockville Auto Top Co.**, 43 George Street, Brockville, Ont., will build a workshop 26 x 74 ft., with wing, 20 x 20 ft.

### FOREIGN

**Compania Huiera Mexicana, S. A.**, Mexico City, Mexico, recently organized by General Plutarco E. Calles (Secretary of War) and associates, plans works for manufacture of synthetic rubber from petroleum. Cost over $100,000. Mr. Calles will be president; Aaron A. Saenz, Secretary of Industry, will be an official of company.

**Department of Public Works**, Tenders Committee, Wellington, New Zealand, asks bids until April 5 for power switchboards and accessory equipment for Waitak generating station.

**State Department of Finance**, Santiago, Chile, plans oil refinery, either State-owned or with State interest, in connection with concession to be granted an oil company. Legislature now arranging bill. Cost over $1,000,000.

**Siemens-Halske, A. G.**, Berlin, Germany, manufacturer of electrical and telephone equipment, has contract for installation of dial telephone system for 22,000 subscribers at Montevideo, Uruguay, at $3,000,000.

**Naphtha Industry & Tank Farm Co. (Nitag)**, Berlin, Germany, closed with Standard Oil Co. of Indiana, 910 South Michigan Avenue, Chicago, for distribution of American gasoline in Germany. First noted company will increase capital from 2,550,000 to 5,600,000 m. (about $612,000 to $1,344,000) part of fund to be used for bulk oil storage and distributing plants, barge unloading facilities, etc.

**John Mackintosh & Sons, Ltd.**, Halifax, England, manufacturer of toffee and other food products, leased property at Toronto, Ont., for branch plant. Cost over $75,000 with machinery.